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For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer.*

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Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*

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Includes passenger and cargo air transport operations; and aircraft accidents.

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Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

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05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE **2469**

Includes aircraft simulation technology.

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06 AIRCRAFT INSTRUMENTATION **N.A.**

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER **2472**

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

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Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

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Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

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82 DOCUMENTATION AND INFORMATION SCIENCE 2664
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS 2666
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 2667
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 2667
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 2669
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 2670
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 2684
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 2685
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 2686

Note: N.A. means that no abstracts were assigned to this category for this issue.

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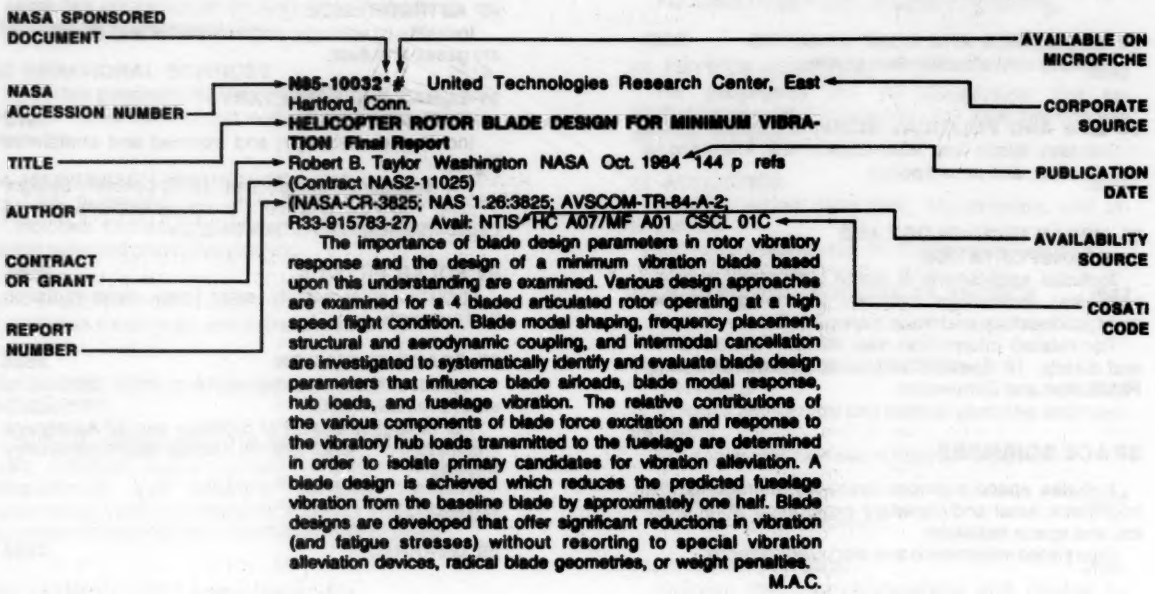
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HELICOPTER ROTOR BLADE DESIGN FOR MINIMUM VIBRATION Final Report
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COSATI CODE
The importance of blade design parameters in rotor vibratory response and the design of a minimum vibration blade based upon this understanding are examined. Various design approaches are examined for a 4 bladed articulated rotor operating at a high speed flight condition. Blade modal shaping, frequency placement, structural and aerodynamic coupling, and intermodal cancellation are investigated to systematically identify and evaluate blade design parameters that influence blade airloads, blade modal response, hub loads, and fuselage vibration. The relative contributions of the various components of blade force excitation and response to the vibratory hub loads transmitted to the fuselage are determined in order to isolate primary candidates for vibration alleviation. A blade design is achieved which reduces the predicted fuselage vibration from the baseline blade by approximately one half. Blade designs are developed that offer significant reductions in vibration (and fatigue stresses) without resorting to special vibration alleviation devices, radical blade geometries, or weight penalties.
M.A.C.

VOLUME 23 NUMBER 15 / AUGUST 8, 1985

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N85-25168# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.

US ARMY AVIATION ENGINEERING FLIGHT ACTIVITY (USAAEFA) REPORT BIBLIOGRAPHY UPDATE 1983 - 1984

K. R. Ferrell Jan. 1985 10 p

(AD-A151381; USAAEFA-84-90) Avail: NTIS HC A02/MF A01 CSCL 01/3

This mission of the US Army Aviation Engineering Flight activity (USAAEFA) is to conduct airworthiness qualification flight tests of air vehicles developed and/or procured as integrated systems and airworthiness evaluations of those vehicles proposed or considered for Army application or which incorporate advanced concepts having potential military application; produce test data on basic air vehicle performance, handling qualities, system/subsystem interface, and integrated system performance; and conduct a test pilot orientation course to prepare Army aviators for attendance at US Naval Test Pilot School. The bibliography is listed by both project number and aircraft type tested or involved in the test of the equipment or procedures. The project listing is in chronological order from 1983 through 1984. Missing numbers in the sequential project listing occur because of cancellations or restructuring of programs. The aircraft listing contains project numbers as well as all other information and allows the user an alternate method for obtaining necessary project information. Appendix A provides a quick reference list of the aircraft by contractor. Bibliography holders of record will automatically receive yearly supplemental listings. GRA

N85-25169# RAND Corp., Santa Monica, Calif.

MANAGING RECOVERABLE AIRCRAFT COMPONENTS IN THE PPB (PLANNING, PROGRAMMING AND BUDGETING) AND RELATED PROCESSES. TECHNICAL VOLUME Interim Report

J. Bigelow Jun. 1984 390 p

(Contract MDA903-81-C-0381)

(AD-A152014; RAND/R-3094-MIL) Avail: NTIS HC A17/MF A01 CSCL 05/1

This report describes a methodology called ORACLE--Oversight of Resources and Capability for Logistics Effectiveness. ORACLE's purpose is to assess the effects of varying certain resource levels on the peacetime materiel readiness and wartime sustainability of U.S. Air Forces, so that resource requirements can be better estimated and justified. It is intended primarily for use in the Planning, Programming, and Budgeting (PPB) process, but it can also be useful during execution. The author concludes that by itself, ORACLE should have significant value for resource planning. In conjunction with an improved forecasting capability and an execution tracking and control system, ORACLE's value will only be enhanced. GRA

N85-25170*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

MISSIONS AND VEHICLE CONCEPTS FOR MODERN, PROPELLED, LIGHTER-THAN-AIR VEHICLES

Mark D. Ardema and A. D. Young, ed. (Queen Mary Coll., London) Feb. 1985 52 p refs

(NASA-TM-87461; NAS 1.15:87461; AGARD-R-724; ISBN-92-835-1492-0) Avail: NTIS HC A04/MF A01 CSCL 01B

Missions and vehicle concepts for modern propelled lighter-than-air vehicles were assessed. Utilization of these vehicles for patrol and surveillance, vertical heavy-lift, high altitude platforms and transportation missions are reported. E.A.K.

N85-25171# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

TRANSONIC UNSTEADY AERODYNAMICS AND ITS AEROELASTIC APPLICATIONS

Loughton, England Jan. 1985 318 p refs In ENGLISH and FRENCH Conf. held in Toulouse, 2-7 Sep. 1984

(AGARD-CP-374; ISBN-92-835-0371-6) Avail: NTIS HC A14/MF A01

Theoretical, numerical, and experimental techniques in transonic unsteady aerodynamics and their application to aeroelastic problems of aircraft loads, stability, and flutter are discussed. Supercritical, rectangular, and swept wing configurations are considered. For individual titles, see N85-25172 through N85-25187.

N85-25172*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

TRENDS IN COMPUTATIONAL CAPABILITIES FOR FLUID DYNAMICS c34

Victor L. Peterson *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 9 p refs Document previously announced as N84-33383 (For primary document see N85-25171 15-01)

Avail: NTIS HC A14/MF A01 CSCL 20D

Milestones in the development of computational aerodynamics are reviewed together with past, present, and future computer performance (speed and memory) trends. Factors influencing computer performance requirements for both steady and unsteady flow simulations are identified. Estimates of computer speed and memory that are required to calculate both inviscid and viscous, steady and unsteady flows about airfoils, wings, and simple wing body configurations are presented and compared to computer performance which is either currently available, or is expected to be available before the end of this decade. Finally, estimates of the amounts of computer time that are required to determine flutter boundaries of airfoils and wings at transonic Mach numbers are presented and discussed. Author

N85-25173# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik.

TRANSONIC PRESSURE DISTRIBUTIONS ON A TWO-DIMENSIONAL 0012 AND SUPERCRITICAL MBB-A3 PROFILE

OSCILLATING IN HEAVE AND PITCH c02
H. Tiebstein and R. Voss *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 24 p refs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

Steady and unsteady aerodynamic data were measured on 2-d rectangular wings with a NACA 0012 and a supercritical MBB-A3 profile. The tests were performed in the DFVLR Transonic Wind Tunnel in Gottingen. Both wings were oscillated in pitch about the c/4 axis, the wing with the MBB-A3 profile was also oscillated in heave to generate the unsteady aerodynamic pressure data. The purpose of the wind tunnel tests was primarily to measure data for use in the development and assessment of transonic analytical codes. Systematic measurements were performed with respect to Mach number, reduced frequency, incidence and amplitude of oscillation. The test results show clearly the peculiar unsteady behavior of transonic flow, particularly the strong nonlinearities associated with shock and higher incidences. Emphasis is also placed on the higher harmonic parts of unsteady pressure induced by the occurrence of shock. The measured data serve well as a basis for comparison with corresponding theoretical results. Comparisons between measurements and numerical results from the finite difference code LTRAN2 and the field panel code PTRAN2 show fairly good agreement. Most of the results in this presentation were obtained from MBB-A3 profile. M.G.

N85-25174# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NUMERICAL STUDIES OF UNSTEADY TRANSONIC FLOW OVER OSCILLATING AIRFOIL c02
W. J. Chyu and S. S. Davis *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 22 p refs Document previously announced as N83-12316 (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01 CSCL 01A

A finite difference solution to the Navier-Stokes equations combined with a time varying grid generation technique was used to compute unsteady transonic flow over an oscillating airfoil. These computations were compared with experimental data (obtained at Ames Research Center) which form part of the AGARD standard configuration for aeroelastic analysis. A variety of approximations to the full Navier-Stokes equations was used to determine the effect of frequency, shock wave motion, flow separation, and airfoil geometry on unsteady pressures and overall air loads. Good agreement is shown between experiment and theory with the limiting factor being the lack of a reliable turbulence model for high Reynolds number, unsteady transonic flows. Author

N85-25175# National Aerospace Lab., Amsterdam (Netherlands).
ANALYSIS OF TRANSONIC AERODYNAMIC CHARACTERISTICS FOR A SUPERCRITICAL AIRFOIL OSCILLATING IN HEAVE, PITCH AND WITH OSCILLATING FLAP c02
R. C. denBoer and R. Houwink *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 15 p refs Sponsored in part by Netherlands Agency for Aerospace Programs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

An analysis is given of the unsteady aerodynamic characteristics of an oscillating supercritical airfoil with a thickness of 12% chord. Experimental data were obtained in the National Aerospace Laboratory (NLR) pilot tunnel for pitching, heaving and flap rotation, with Mach number, mean incidence, frequency and amplitude as parameters. The influence of these parameters is discussed in physical terms, with special emphasis on flow conditions with shock induced separation and aerodynamic resonance. Both for attached and separated flow, examples are presented of the use of experimental unsteady airloads in flutter computations for a wind tunnel model of a supercritical wing, and in correlation with results of viscous transonic flow computations. M.G.

N85-25176*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. Unsteady Aerodynamics Branch.
EXPERIENCE WITH TRANSONIC UNSTEADY AERODYNAMIC CALCULATIONS c02
J. W. Edwards, S. R. Bland, and D. A. Seidel *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 21 p refs Document previously announced as N84-32353 (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01 CSCL 01A

Comparisons of calculated and experimental transonic unsteady pressures and airloads for four of the AGARD Two Dimensional Aeroelastic Configurations and for a rectangular supercritical wing are presented. The two dimensional computer code, XTRAN2L, implementing the transonic small perturbation equation was used to obtain results for: (1) pitching oscillations of the NACA 64A010A; NLR 7301 and NACA 0012 airfoils; (2) flap oscillations for the NACA 64A006 and NRL 7301 airfoils; and (3) transient ramping motions for the NACA 0012 airfoils. Results from the three dimensional code XTRAN3S are compared with data from a rectangular supercritical wing oscillating in pitch. These cases illustrate the conditions under which the transonic inviscid small perturbation equation provides reasonable predictions.
Author

N85-25177# Royal Aircraft Establishment, Farnborough (England).
CALCULATION OF HARMONIC AERODYNAMIC FORCES OF AEROFOILS AND WINGS FROM THE EULER EQUATIONS c02
Deborah J. Salmond *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 17 p refs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

A method developed to solve the Euler equations to obtain transonic aerodynamic forces on oscillating and wings is described. It is an extension of the implicit, finite difference method used by Pulliam and Steger to solve the Euler equations for the steady, transonic flow past an airfoil. Results in the form of steady pressure distributions and unsteady first harmonic, unsteady pressure coefficients are presented. Comparisons with the experimental results of Davis and Malcolm for the NACA 64A010 (Ames model) airfoil and those of Mabey for the AGARD tailplane are included. M.G.

N85-25178# Office National d'Etudes et de Recherches Aerospatiales, Leclerc (France).
CALCULATION OF UNSTEADY TRANSONIC SEPARATED FLOWS BY VISCOUS-INVISCID INTERACTION c02
P. Girodroux-Lavigne and J. C. LeBalleur *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 18 p refs In FRENCH; ENGLISH summary Original document previously announced as A85-12621 (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

A technique based on viscid-inviscid flow interaction is used to describe separated and unseparated unsteady transonic flows over airfoils. A semi-implicit and time-consistent numerical formulation with semi-implicit relaxation provides strong coupling, and a local mesh clustering expresses the shock wave-boundary layer interaction. Direct and inverse mode solutions are defined for the boundary layer and wake defect integrals. The integral equations are closed by using instantaneous boundary layer profiles and defining a set of transport equations for turbulence. A small perturbation equation accounts for the inviscid flow. Sample results are calculated for flows over a NLG 7301 airfoil, a NACA 64 A 010 airfoil with shock-induced separation, and an oscillating RA 16 SC1 airfoil with a spoiler. M.S.K. (IAA)

N85-25179# British Aerospace Aircraft Group, Woodford (England).
A SEMI-EMPIRICAL UNSTEADY TRANSONIC METHOD WITH SUPERSONIC FREE STREAM c02
M. J. Green and D. Lambert *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 16 p refs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

Garner's semi-empirical method for predicting oscillatory transonic aerodynamic characteristics on wings was extended to Mach numbers greater than unity. The object is to provide an economical means of carrying out transonic flutter calculations at a time when more sophisticated and costly methods are not available for routine use. To predict the unsteady transonic behavior, the method combines steady transonic pressures, obtainable from theory or experiment, with unsteady velocity potentials provided by linearized supersonic theory. Experimental quasisteady data obtained from a series of wind tunnel tests carried out at RAE Bedford on a low aspect ratio wing were used to predict the unsteady pressures at non-zero frequencies. These results were compared with the corresponding unsteady measurements. The method was found to be inadequate near the wing tip and an alternative approach is proposed. Preliminary results show a marked improvement in this region. M.G.

N85-25180# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STATUS AND PROSPECTS OF COMPUTATIONAL FLUID DYNAMICS FOR UNSTEADY TRANSONIC FLOW c02
W. J. McCroskey (Army Aeromechanics Lab.), P. Kutler, and J. C. Bridgman *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 24 p refs Document previously announced as N85-12037 (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01 CSCL 20D

Applications of computational aerodynamics to aeronautical research, design, and analysis have increased rapidly over the past decade, and these applications offer significant benefits to aeroelasticians. The past developments are traced by means of a number of specific examples, and the trends are projected over the next several years. The crucial factors that limit the present capabilities for unsteady analyses are identified; they include computer speed and memory, algorithm and solution methods, grid generation, turbulence modeling, vortex modeling, data processing, and coupling of the aerodynamic and structural dynamic analyses. The prospects for overcoming these limitations are presented, and many improvements appear to be readily attainable. If so, a complete and reliable numerical simulation of the unsteady, transonic viscous flow around a realistic fighter aircraft configuration could become possible within the next decade. The possibilities of using artificial intelligence concepts to hasten the achievement of this goal are also discussed. Author

N85-25181# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
IMPROVEMENT AND EXTENSION OF A NUMERICAL PROCEDURE FOR THE THREE DIMENSIONAL UNSTEADY TRANSONIC FLOWS c02
Pierre Mulak and Jean-Jacques Angelini *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 12 p refs In FRENCH; ENGLISH summary (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

A numerical procedure was developed at ONERA to solve the unsteady transonic flow problems under potential flow and small disturbance approximations, in the case of rectangular or simple swept wings. The use of an alternating direction implicid procedure (ADI) and a functional approach for potential flow allowed a very little computer time consummation and a correct approximation for the small disturbance equation with consistent boundary conditions. The purpose is to extend the method to most general planform wings, including highly swept wings, and to insure correct swept shock jump conditions in any case. Calculations will be compared with experiments made on supercritical wings. Author

N85-25182# National Aerospace Lab., Amsterdam (Netherlands).
APPLICATION OF TIME-LINEARIZED METHODS TO OSCILLATING WINGS IN TRANSONIC FLOW AND FLUTTER c08
H. H. L. Hounjet and J. J. Meijer *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 16 p refs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

Unsteady aerodynamic loads in the transonic domain were obtained with time-linearized methods in which a so-called field panel method is embedded which accounts for a proper radiation of signals towards infinity. The methods are used to predict the unsteady loads and first harmonic pressure distributions on an airfoil and a transport type wing. Results obtained with these methods were correlated with data of unsteady experiments and also with results of other calculation methods. Transonic flutter applications were made to a fighter-type configuration. Author

N85-25183# Lockheed-Georgia Co., Marietta.
COMPUTATION OF UNSTEADY TRANSONIC FLOWS ABOUT TWO-DIMENSIONAL AND THREE-DIMENSIONAL AGARD STANDARD CONFIGURATIONS c02
J. B. Malone, S. Y. Ruo, and N. L. Sankar (Georgia Inst. of Tech.) *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 14 p refs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

Three state-of-the-art, finite-difference computer programs which were developed for the prediction of unsteady transonic flows about airfoil and wing configurations are examined. Descriptions of each computational procedure are given. Numerical results are compared to experimental data for several 2D and 3D AGARD standard configurations. In addition, computational results are presented for a low aspect-ratio wing planform for which a large, experimental data-base is available. Author

N85-25184# Dassault-Breguet Aviation, St. Cloud (France).
CALCULATION OF UNSTEADY TRANSONIC FLOW AROUND A HIGH SWEPT WING c02
A. Laurent *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 24 p refs In FRENCH; ENGLISH summary (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

The calculation of the unsteady transonic flow around a highly swept wing has led to development of a three-dimensional fully conservative code from the two-dimensional ideas of Murman and Cole using a finite difference scheme and an alternating direction implicit method. Extension to the three dimensional-problem of the transonic small disturbance method (the NLR equation) requires the investigation of the direction and type of flow locally. This approach allows the calculation in the physical plan (i.e., without any space transformation). Results on a NACA0012 thirty degrees swept wing, at a flying point, show the co-existence, along the span, of the three kinds of shock motion, as TIDJEMAN found in two-dimensional flows. Some calculations correlated with the experiment on the clean MIRAGE F1 wing tested by ONERA in 1982 will be shown as well as a few test cases of the NORA wing. In view of the aeroelastic implications, attention will be paid to the non-linearities of the phenomena encountered. Author

N85-25185*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
UNSTEADY TRANSONIC AERODYNAMIC AND AEROELASTIC CALCULATIONS ABOUT AIRFOILS AND WINGS c02
Peter M. Goorjian and Guru P. Guruswamy (Informatics General Corp., Palo Alto, Calif.) *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 31 p refs Document previously announced as N84-31092 (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01 CSCL 20D

The development and application of transonic small disturbance codes for computing two dimensional flows, using the code ATRAN2, and for computing three dimensional flows, using the code ATRAN3S, are described. Calculated and experimental results are compared for unsteady flows about airfoils and wings, including several of the cases from the AGARD Standard Aeroelastic Configurations. In two dimensions, the results include AGARD priority cases for the NACA 54A006, NACA 64A010, NACA 0012, and MBB-A3 airfoils. In three dimensions, the results include flow about the F-5 wing, a typical wing, and the AGARD rectangular

wings. Viscous corrections are included in some calculations, including those for the AGARD rectangular wing. For several cases, the aerodynamic and aeroelastic calculations are compared with experimental results. M.A.C.

N85-25186# Messerschmitt-Boelkow-Blohm G.m.b.H., Bremen (West Germany).
THE APPLICATION OF TRANSONIC UNSTEADY METHODS FOR CALCULATION OF FLUTTER AIRLOADS c08
Helmut Zimmermann *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 21 p refs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

With the development of supercritical profiles for aircraft wings the nonlinear unsteady aerodynamic methods in the application for flutter calculation became important. These nonlinear methods demand numerical methods of high accuracy and the inclusion of more physical effects was necessary than for the linear aerodynamic theory. For a representative section with two degrees of freedom and with the aerodynamic shape of the MBB-3 profile unsteady aerodynamic pressure distributions and coefficients for pitch and heave motions were calculated according to different unsteady aerodynamic methods. The steady and unsteady pressure distributions and coefficients were calculated by the Euler, the TSP, the Lin, TSP-Equation and by the Doublet Lattice method, with and without steady corrections. For the Lin, TSP (Linearized Transonic Small-Perturbation) the steady results of TSP and the full Potential Equation were used as the steady velocity potential. With the unsteady aerodynamic coefficients obtained with the different methods flutter calculations were done for the two-degree of freedom system in different frequency ranges. The so-called transonic-dip was found to differ for the aerodynamic methods used. Additionally effects were found which could be explained as probable two-dimensional effects. Author

N85-25187# National Aerospace Lab., Tokyo (Japan).
THE DEVELOPMENT OF UNSTEADY TRANSONIC 3-D FULL POTENTIAL CODE AND ITS AEROELASTIC APPLICATIONS c02
Koji Isogai *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 25 p refs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

The unsteady transonic 3-D full potential code (USTF3), which is based on a two-step semi-implicit time-marching finite difference technique, is outlined. To validate the code the unsteady pressure distributions on the oscillating horizontal tail model (NORA WING) and on the RAE swept tapered wing with oscillating part-span control surface are calculated and compared with the experimental results. The results of the aeroelastic applications of the code, including the static and dynamic aeroelastic response calculations of a high-aspect-ratio transport wing and the time domain numerical simulation of an active control system for a supercritical wing, are presented. Author

N85-25188# Advisory Group for Aerospace Research and Development, Paris (France).
SPECIAL COURSE ON V/STOL AERODYNAMICS: AN ASSESSMENT OF EUROPEAN JET LIFT AIRCRAFT
R. S. Williams (British Aerospace PLC, Surrey) Feb. 1985 25 p refs
(AGARD-R-710-Addendum) Avail: NTIS HC A02/MF A01

The European jet lift V/STOL was examined in order to illustrate the extent to which the power plant has affected aircraft layout and consequently the aerodynamic design. Direct comparisons of V/STOL with contemporary conventional layouts are made. The successful Harrier's aerodynamic progress is highlighted. Promised engine performance advances are shown to offer more aerodynamic freedoms to V/STOL design. Author

N85-25189# Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION
3 May 1985 89 p Transl. into ENGLISH from various Russian articles
(JPRS-UTR-85-008) Avail: NTIS HC A05

Activities in civil aviation are reported as well as advances in transportation by motor vehicles and rail systems, and on waterways. Port and transshipment centers are also covered. For individual titles, see N85-25190 through N85-25191.

N85-25190# Joint Publications Research Service, Arlington, Va.
ROUNDTABLE ON EFFECTIVE USE OF FLIGHT SIMULATORS c09
S. Sokolov, B. Orlov, and I. Kazanskiy *In its* USSR Rept.: Transportation (JPRS-UTR-85-008) 3 May 1985 p 12-19 Transl. into ENGLISH from Grazhdanskaya Aviatsiya (Moscow), no. 1, Jan. 1985 p 12-15 (For primary document see N85-25189 15-01)
Avail: NTIS HC A05

The problems and tasks of efficient utilization of simulators in civil aviation are explored. Expanded use of simulators in flight training, the reluctance of flight commanders to take simulator training, the quality of training of cockpit personnel, and the need for better housing for simulators are discussed. The extension of simulator capabilities is also considered. A.R.H.

N85-25191# Joint Publications Research Service, Arlington, Va.
OFFICIAL ON SOVIET RESEARCH IN DEICING TECHNIQUES c03
In its USSR Rept.: Transportation (JPRS-UTR-85-008) 3 May 1985 p 22-24 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 19 Feb. 1985 p 3 (For primary document see N85-25189 15-01)
Avail: NTIS HC A05

Technical solutions to the problem of deicing protection for aircraft are examined. Further study is needed of the forms, amounts, and conditions of icing on modern and prospective airplanes and helicopters. The parameters being standardized require more exact definition. In-flight experimentation under natural icing conditions is the most effective method of data acquisition. The deicing fluid Arktica must be improved with consideration to environment protection and toxicity. Coordination of efforts and a unified scientific approach to the problem is needed. A.R.H.

N85-25192# Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION
31 May 1984 49 p Transl. into ENGLISH from various Russian articles
(JPRS-UTR-84-015) Avail: NTIS HC A03

Improvements in air traffic control, international flights under the Civil Air Code, the need for the better storage batteries, and a numerical coding system for freight cars are discussed. Port operations and management are also considered. For individual titles, see N85-25193 through N85-25195.

N85-25193# Joint Publications Research Service, Arlington, Va.
ADMINISTRATION CHIEF ON AIR TRAFFIC CONTROL IMPROVEMENTS c04
A. Kolesnikov *In its* USSR Rept.: Transportation (JPRS-UTR-84-015) 31 May 1984 p 1-4 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 3, Mar. 1984 p 30-31 (For primary document see N85-25192 15-01)
Avail: NTIS HC A03

The implementation of a unified system of air traffic control in the Soviet Union, the introduction of automated air terminal and air routing systems, and the installation of unified air traffic controllers' consoles with modern radio and secondary radar equipment are discussed. The main link in the operation of the air traffic control system is the controller. Intense attention is being paid to raising the professional, ethical, and political level of these personnel through training at educational establishments, the use of special training equipment, and in-service training at aviation enterprises. More attention should be given to technical training and system work in the traffic control services themselves. The role of flight supervisors as the primary teachers for each shift is examined. A.R.H.

N85-25194# Joint Publications Research Service, Arlington, Va.
CIVIL AIR CODE INTERNATIONAL FLIGHTS SECTION EXPLAINED c03
A. Zinevich *In its* USSR Rept.: Transportation (JPRS-UTR-84-015) 31 May 1984 p 5-9 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 3, Mar. 1984 p 32-33 (For primary document see N85-25192 15-01)
Avail: NTIS HC A03

International flights are intimately connected with both the political and economic interests of the USSR. The growing volume of flights into and out of the country influenced the content and development of the eight articles of the civil air code recently promulgated. Apparent contradictions in provisions of the various articles of the code are resolved. The functions of the Ministry of Aviation, and regulations covering one-time special flights of foreign aircraft over Soviet territory, are examined as well as authorization for the use of other than established routes and takeoff and landing sites. Certification of airworthiness and measures to prevent air piracy are also covered. A.R.H.

N85-25195# Joint Publications Research Service, Arlington, Va.
LEAD SHORTAGE HASTENS NEED FOR IMPROVED STORAGE BATTERIES c33
M. Karpunin and V. V. Bogorodskiy *In its* USSR Rept.: Transportation (JPRS-UTR-84-015) 31 May 1984 p 10-14 Transl. into ENGLISH from Mater.-Tekh. Snabzheniye (Moscow), no. 1, Jan. 1984 p 21-23 (For primary document see N85-25192 15-01)
Avail: NTIS HC A03

In Soviet factories, technology for battery production is developed and introduced, battery quality is being raised, and service life increased. However, requirements for chemical sources of electrical current, especially lead, are not being completely met. This is explained primarily by the lack of sufficient metal. The inefficient use of lead, losses of lead during production, the waste of scrap lead, and delay in developing polyvinylchloride resins to improve battery separators are discussed. Extracting lead from battery scrap, reconditioning lead acid batteries, and substituting aluminum and steel tape for lead in the production of electrical cables are methods being used to increase the supply of lead. A.R.H.

N85-25196# Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION
13 Jun. 1984 65 p Transl. into ENGLISH from various Russian articles
(JPRS-UTR-84-017) Avail: NTIS HC A04/MF A01

Various topics on transportation with U.S.S.R. are discussed. Civil aviation, fuel shortages, rail transportation, aircraft lightning hazards, ship maintenance, and energy conservation are among the topics covered. For individual titles, see N85-25197 through N85-25199. R.J.F.

N85-25197# Joint Publications Research Service, Arlington, Va.
AVIATION WORKERS PLENUM REVIEWS FUEL CONSERVATION PROGRESS
A. Zuyev *In its* USSR Rept.: Transportation (JPRS-UTR-84-017) 13 Jun. 1984 p 1-11 Transl. into ENGLISH of Vozdushnyy Transport (Moscow), 7 Apr. 1984 p 1-2 (For primary document see N85-25196 15-01)
Avail: NTIS HC A04/MF A01

The Sixth Plenum of the Aviation Workers Trade Union Central Committee was held in Moscow on 4 April. The plenum examined the tasks of aviation workers trade union organizations to intensify economicy of fuel and power and other material resources in light of the decisions of the February (1984) plenum of the CPSU Central Committee. Productivity, incentives, and management techniques are discussed. R.J.F.

N85-25198# Joint Publications Research Service, Arlington, Va.
CHRONIC FUEL SHORTAGES IN VOLGA CIVIL AVIATION ADMINISTRATION c28
A. Sherstnev *In its* USSR Rept.: Transportation (JPRS-UTR-84-017) 13 Jun. 1984 p 12-15 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 31 Mar. 1984 p 2 (For primary document see N85-25196 15-01)
Avail: NTIS HC A04/MF A01

The causes and consequences of chronic aviation fuel and lubrication shortages in the Volga region are discussed. The planning of aviation fuel deliveries is analyzed. R.J.F.

N85-25199# Joint Publications Research Service, Arlington, Va.
EFFECTS OF LIGHTNING ON AIRCRAFT STUDIED AT SHEREMETYEVO c03
L. Tsesarkin and Oleg Konstantinovich Trunov *In its* USSR Rept.: Transportation (JPRS-UTR-84-017) 13 Jun. 1984 p 16-18 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 31 Mar. 1984 p 4 (For primary document see N85-25196 15-01)
Avail: NTIS HC A04/MF A01

The effects of lightning on aircraft are discussed. The bypassing of danger zones, lightning resistance, atmospheric electricity, and anti-lightning systems are covered. R.J.F.

N85-25616# Joint Publications Research Service, Arlington, Va.
MBB COST-REDUCTION PLAN FOR AIRBUS CONSTRUCTION DESCRIBED
Klaus Wiborg *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-027) 17 Aug. 1984 p 18-20 Transl. into ENGLISH from Franfurter Allgem. Zeitung (Frankfurt am Main), 8 Jun. 1984 p 18 (For primary document see N85-25612 15-31)
Avail: NTIS HC A04/MF A01

N85-25638# Joint Publications Research Service, Arlington, Va.
FRG JOURNAL ANALYZES STATE, PROSPECTS OF AIRBUS PROGRAMS: GENERAL ANALYSIS
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-003) 16 Jan. 1984 p 10-16 Transl. into ENGLISH from Handelsblatt (Dusseldorf), 25/26 Nov. 1983 p 25 (For primary document see N85-25635 15-31)
Avail: NTIS HC A04/MF A01

N85-25649# Joint Publications Research Service, Arlington, Va.
FINANCIAL, ECONOMIC COMMENTARY ON AIRBUS, EUROPEAN AVIATION
Philippe Gazier and Jean Gloguen *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-014) 4 May 1984 p 16-20 Transl. into ENGLISH from Nouvel Economiste (Paris), 5 Mar. 1984 p 66-70 (For primary document see N85-25647 15-31)
Avail: NTIS HC A04/MF A01

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N85-25200 North Carolina State Univ., Raleigh.
A NEW IMPLICIT PLUS MINUS SPLITTING METHOD FOR THE SOLUTION OF THE EULER EQUATIONS IN THE TRANSONIC FLOW REGIME Ph.D. Thesis
Creighton Mark Seaford 1984 100 p
Avail: Univ. Microfilms Order No. DA8429010

A plus minus flux vector splitting formulation of the two-dimensional time dependent Euler equations in strong conservation law form for a system of generalized body conforming curvilinear coordinates was developed and is based on the mathematical property of hyperbolic equations and the well-established theory of characteristics. The spatial flux vectors of the conservation law equations are split in terms of the sign of the characteristic speeds of the coefficient matrices. One-sided difference operators are then applied to each split flux vector. The conservation of energy equation is satisfied by the statement that the flow is adiabatic. Hence, the number of governing equations is reduced from 4 to 3. The finite difference equations are solved by means of a

relaxation method based on the Peaceman-Rachford scheme. Such a procedure, conjunction with the implementation of implicit boundary conditions, yields a robust code and improved convergence history. Results obtained for flows over various airfoils and a full circular cylinder with similar results obtained from existing Euler codes are compared. Several solutions of a symmetrical NACA 0012 at various Mach numbers and angles of attack are compared and the solution of the flow field of a cambered NACA 64A410 is presented. Dissert. Abstr.

N85-25201*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Mechanical Engineering.

EXPERIMENTAL AND ANALYTICAL INVESTIGATION OF FAN FLOW INTERACTION WITH DOWNSTREAM STRUTS Interim Report, 16 Jun. 1984 - 15 Mar. 1985

T. L. Olsen, W. F. Ng, and W. F. OBrien, Jr. Apr. 1985 42 p refs

(Grant NAG1-486)

(NASA-CR-175756; NAS 1.26:175756; IR-1) Avail: NTIS HC A03/MF A01 CSCL 01A

An investigation which was designed to provide insight into the fundamental aspects of fan rotor-downstream strut interaction was undertaken. High response, miniature pressure transducers were embedded in the rotor blades of an experimental fan rig. Five downstream struts were placed at several downstream locations in the discharge flow annulus of the single-stage machine. Significant interaction of the rotor blade surface pressures with the flow disturbance produced by the downstream struts was measured. Several numerical procedures for calculating the quasi-steady rotor response due to downstream flow obstructions were developed. A preliminary comparison of experimental and calculated fluctuating blade pressures on the rotor blades shows general agreement between the experimental and calculated values. G.L.C.

N85-25202*# Analytical Methods, Inc., Redmond, Wash.

UNSTEADY ANALYSIS OF ROTOR BLADE TIP FLOW Final Report

B. Maskey and B. M. Rao Washington NASA May 1985 57 p refs

(Contract NAS1-15472)

(NASA-CR-3868; NAS 1.26:3868; AMI-8412) Avail: NTIS HC A04/MF A01 CSCL 01A

The development of the VSAERO-TS and VSAERO-H computer programs for calculating the unsteady aerodynamic characteristics of arbitrarily shaped wings oscillating in pitch is presented. The effect of several wake parameters on chordwise pressure distribution in VSAERO-TS is given and the convergence characteristics of both programs are discussed. In the program, the influence coefficient for each panel is formulated for a planar surface and so a skewed panel is represented by a projected flat quadrilateral lying in the mean plane. Since panels in the extreme roll-up region of the tip vortex are highly skewed the program was modified to treat each highly skewed panel as a pair of triangles. The programs are validated by comparing the chordwise pressure distribution of several blade tip planforms with experimental data. The comparison, for the most part, is good. The triangular panel representation improved the chordwise pressure distribution near the tip region for higher mean angle of attack. A.R.H.

N85-25203*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

TRANSONIC AERODYNAMIC AND AEROELASTIC CHARACTERISTICS OF A VARIABLE SWEEP WING

P. M. Goorjian, G. P. Guruswamy (Informatics General Corp., Palo Alto, Calif.), H. Ide, and G. Miller (Rockwell International, Los Angeles, Calif.) Feb. 1985 18 p refs

(NASA-TM-86677; A-85119; NAS 1.15:86677) Avail: NTIS HC A02/MF A01 CSCL 01A

The flow over the B-1 wing is studied computationally, including the aeroelastic response of the wing. Computed results are compared with results from wind tunnel and flight tests for both low-sweep and high-sweep cases, at 25.0 deg. and 67.5 deg., respectively, for selected transonic Mach numbers. The aerodynamic and aeroelastic computations are made by using the transonic unsteady code ATRAN3S. Steady aerodynamic computations compare well with wind tunnel results for the 25.0 deg. sweep case and also for small angles of attack at the 67.5 deg. sweep case. The aeroelastic response results show that the wing is stable at the low sweep angle for the calculation at the Mach number at which there is a shock wave. In the higher sweep case, for the higher angle of attack at which oscillations were observed in the flight and wind tunnel tests, the calculations do not show any shock waves. Their absence lends support to the hypothesis that the observed oscillations are due to the presence of leading edge separation vortices and are not due to shock wave motion as was previously proposed. Author

N85-25204*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PREDICTION OF VORTEX-INDUCED LOADS ON WIND-TUNNEL TURNING VANES

James C. Ross Mar. 1985 28 p refs

(NASA-TM-86678; A-85123; NAS 1.15:86678) Avail: NTIS HC A03/MF A01 CSCL 01A

Models tested in the National Full-Scale Aerodynamic Complex at NASA Ames Research Center can generate strong wake vortices which in turn can induce large increases in the local loads on the turning vanes located downstream from the two test sections. A 3-D panel method which models wake roll up (VSAERO) was used to estimate the magnitude of these loads. In the simulation a rectangular wing at angle of attack sheds a wake which is allowed to roll up and interact with a smaller chord, high-aspect ratio wing which represents a single vane. Results agree well with experimental data and are consistent with previously reported results. A method is given for correcting the panel code results for the effects of vane set solidity and of the vortex passage through a diffuser before it interacts with the vane set. Estimates of the induced vortex loads on the vane sets downstream from the 40- by 80- and 80- by 120-foot test sections indicate that the induced local loads on a van can, in some cases, be more than 50% of the steady-state turning loads of an individual vane. Author

N85-25205*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

APPROXIMATE NEUTRAL POINT OF A SUBSONIC CANARD AIRCRAFT

James D. Phillips Apr. 1985 12 p refs

(NASA-TM-86694; A-85151; NAS 1.15:86694) Avail: NTIS HC A02/MF A01 CSCL 01A

An approximate formula is derived for the position of the neutral point in canard aircraft. This formula accounts for the aerodynamic interference between the wing (rear wing) and the canard (forward wing). Topics covered include determination of the canard downwash derivative, determination of the canard and wing liftslopes including the aerodynamic interference, and calculation of the neutral point position. A.R.H.

N85-25206*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

NONLINEAR PROBLEMS IN FLIGHT DYNAMICS INVOLVING AERODYNAMIC BIFURCATIONS

Murray Tobak and Gary T. Chapman Mar. 1985 18 p refs Presented at the AGARD Symp. on Unsteady Aerodyn. Fundamentals and Appl. to Aircraft Dyn., Goettingen, West Germany, 6-9 May 1985

(NASA-TM-86706; A-85179; NAS 1.15:86706) Avail: NTIS HC A02/MF A01 CSCL 01A

Aerodynamic bifurcation is defined as the replacement of an unstable equilibrium flow by a new stable equilibrium flow at a critical value of a parameter. A mathematical model of the aerodynamic contribution to the aircraft's equations of motion is amended to accommodate aerodynamic bifurcations. Important bifurcations such as, the onset of large-scale vortex-shedding are defined. The amended mathematical model is capable of incorpo-

rating various forms of aerodynamic responses, including those associated with dynamic stall of airfoils. E.A.K.

N85-25207*# National Aeronautics and Space Administration, Washington, D. C.
PERIODIC VORTEX SHEDDING IN THE SUPERSONIC WAKE OF A PLANAR PLATE
W. F. Xing and G. Marenbach May 1985 14 p refs Transl. into ENGLISH from Rheinisch-Westfaelische Technische Hochschule Aerodynamisches Inst. (West Germany), Abhandlungen 26, 1983 p 48-52 Original language document was announced in IAA as A84-20842 Transl. by The Corporate Word, Inc., Pittsburgh
(Contract NASw-4006)
(NASA-TM-77854; NAS 1.15:77854) Avail: NTIS HC A02/MF A01 CSCL 01A

Vortex sheets in the wake have been mainly studied in incompressible flows and in the transonic region. Heinemann et al. (1976) have shown that for the subsonic region the Strouhal number is nearly independent of the Mach number. Motallebi and Norbury (1981) have observed an increase in the Strouhal number in transonic supersonic flow at Mach numbers up to 1.25. The present investigation is concerned with an extension of the studies of vortex shedding to higher supersonic Mach numbers, taking into account questions regarding the possibility of a generation of stable von Karman vortex paths in the considered Mach number range. It is found that the vortex sheet observed in a supersonic wake behind a rough plate is only stable and reproducible in cases involving a certain surface roughness and certain aspects of trailing edge geometry. G.R. (IAA)

N85-25208*# North Carolina State Univ., Raleigh. Mechanical and Aerospace Engineering Dept.
AN EXPLORATORY STUDY OF APEX FENCE FLAPS ON A 74 DEG DELTA WING
Richard A. Wahls and Robert J. Vess May 1985 30 p refs
(Contract NCC1-46)
(NASA-CR-172463; NAS 1.26:172463) Avail: NTIS HC A03/MF A01 CSCL 01A

An exploratory wind tunnel investigation was performed to observe the flow field effects produced by vertically deployed apex fences on a planar 74 degree delta wing. The delta shaped fences, each comprising approximately 3.375 percent of the wing area, were affixed along the first 25 percent of the wing leading edge in symmetric as well as asymmetric (i.e., fence on one side only) arrangements. The vortex flow field was visualized at angles of attack from 0 to 20 degrees using helium bubble and oil flow techniques; upper surface pressures were also measured along spanwise rows. The results were used to construct a preliminary description of the vortex patterns and induced pressures associated with vertical apex fence deployment. The objective was to obtain an initial evaluation of the potential of apex fences as vortex devices for subsonic lift modulation as well as lateral directional control of delta wing aircraft. Author

N85-25209*# North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.
INVESTIGATION OF THE VORTEX TAB M.S. Thesis
Keith D. Hoffler May 1985 79 p refs
(Contract NCC1-46)
(NASA-CR-172586; NAS 1.26:172586) Avail: NTIS HC A05/MF A01 CSCL 01A

An investigation was made into the drag reduction capability of vortex tabs on delta wing vortex flaps. The vortex tab is an up-deflected leading edge portion of the vortex flap. Tab deflection augments vortex suction on the flap, thus improving its thrust, but the tab itself is drag producing. Whether a net improvement in the drag reduction can be obtained with vortex tabs, in comparison with plane vortex flaps of the same total area, was the objective of this investigation. Wind tunnel tests were conducted on two models, and analytical studies were performed on one of them using a free vortex sheet theory. Author

N85-25210*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
STUDIES ON THE INTERFERENCE OF WINGS AND PROPELLER SLIPSTREAMS Final Report
Ramadas K. Prabhu and Surendra N. Tiwari May 1985 113 p refs
(Grant NCC1-65)
(NASA-CR-175753; NAS 1.26:175753) Avail: NTIS HC A06/MF A01 CSCL 01A

The small disturbance potential flow theory is applied to determine the lift of an airfoil in a nonuniform parallel stream. The given stream is replaced by an equivalent stream with a certain number of velocity discontinuities, and the influence of these discontinuities is obtained by the method of images. Next, this method is extended to the problem of an airfoil in a nonuniform stream of smooth velocity profile. This model allows perturbation velocity potential in a rotational undisturbed stream. A comparison of these results with numerical solutions of Euler equations indicates that, although approximate, the present method provides useful information about the interaction problem while avoiding the need to solve the Euler equations. G.L.C.

N85-25211*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A 3-DIMENSIONAL NAVIER-STOKES-EULER CODE FOR BLUNT-BODY FLOW COMPUTATIONS
Chien-peng Li Apr. 1985 27 p refs
(NASA-TM-58266; S-546; NAS 1.15:58266) Avail: NTIS HC A03/MF A01 CSCL 01A

The shock-layer flowfield is obtained with or without viscous and heat-conducting dissipations from the conservative laws of fluid dynamics equations using a shock-fitting implicity finite-difference technique. The governing equations are cast in curvilinear-orthogonal coordinates and transformed to the domain between the shock and the body. Another set of equations is used for the singular coordinate axis, which, together with a cone generator away from the stagnation point, encloses the computation domain. A time-dependent alternating direction implicit factorization technique is applied to integrate the equations with local-time increment until a steady solution is reached. The shock location is updated after the flowfield computation, but the wall conditions are implemented into the implicit procedure. Innovative procedures are introduced to define the initial flowfield, to treat both perfect and equilibrium gases, to advance the solution on a coarse-to-fine grid sequence, and to start viscous flow computations from their corresponding inviscid solutions. The results are obtained from a grid no greater than 28 by 18 by 7 and converged within 300 integration steps. They are of sufficient accuracy to start parabolized Navier-Stokes or Euler calculations beyond the nose region, to compare with flight and wind-tunnel data, and to evaluate conceptual designs of reentry spacecraft. E.A.K.

N85-25212*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
ANALYSIS OF SELECTED PROBLEMS INVOLVING VORTICAL FLOWS
Leonard Roberts, D. J. Lee, and Nikos J. Mourtos Apr. 1985 80 p refs
(Contract NCC2-149)
(NASA-CR-177347; NAS 1.26:177347) Copyright. Avail: NTIS HC A05/MF A01 CSCL 01A

Three selected problems involving vortical flows are analyzed and discussed including: the trailing vortex behind a wing; rotor blade-vortex interaction; and the leading edge vortex on a flat plate. For individual titles, see N85-25213 through N85-25215.

N85-25213*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
ON THE STRUCTURE OF THE TURBULENT VORTEX
Leonard Roberts *In its* Anal. of Selected Probl. Involving Vortical Flows Apr. 1985 p 6-17 refs Previously announced as N84-12102
(For primary document see N85-25212 15-02)
Avail: NTIS HC A05/MF A01 CSCL 01A

The trailing vortex generated by a lifting surface, the structure of its turbulent core and the influence of axial flow within the vortex on its initial persistence and on its subsequent decay are described. Similarity solutions of the turbulent diffusion equation are given in closed form and results are expressed in sufficiently simple terms that the influence of the lifting surface parameters on the length of persistence and the rate of decay of the vortex can be evaluated. E.A.K.

N85-25214*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.

INTERACTION OF A TURBULENT VORTEX WITH A LIFTING SURFACE

D. J. Lee and Leonard Roberts *In its* Anal. of Selected Probl. Involving Vortical Flows Apr. 1985 p 18-28 refs Previously announced in IAA as A84-19452 (For primary document see N85-25212 15-02)

Avail: NTIS HC A05/MF A01 CSCL 01A

The impulsive noise due to blade-vortex-interaction is analyzing in the time domain for the extreme case when the blade cuts through the center of the vortex core with the assumptions of no distortion of the vortex path or of the vortex core. An analytical turbulent vortex core model, described in terms of the tip aerodynamic parameters, is used and its effects on the unsteady loading and maximum acoustic pressure during the interaction are determined. Author

N85-25215*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.

FLOW PAST A FLAT PLAT WITH A VORTEX/SINK COMBINATION

Nikos J. Mourtos *In its* Anal. of Selected Probl. Involving Vortical Flows Apr. 1985 p 29-77 refs (For primary document see N85-25212 15-02)

(JIAA-TR-58) Avail: NTIS HC A05/MF A01 CSCL 01A

An attempt was made to model the so called leading edge vortex which forms over the leading edge of delta wings at high angles of attack. A simplified model was considered, namely that of a two-dimensional, inviscid, incompressible steady flow around a flat plate at an angle of attack with a stationary vortex detached on top, as well as a sink to simulate the strong spanwise flow. The results appear to agree qualitatively with experiments. A comparison was also made between the lift and the drag of this model and the corresponding results for two classical solutions: (1) that of totally attached flow over the plate with the Kutta condition satisfied at the trailing edge only; and (2) the Helmholtz solution of totally separated flow over the plate. M.G.

N85-25216*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

MODIFICATIONS TO THE NOZZLE TEST CHAMBER TO EXTEND NOZZLE STATIC-TEST CAPABILITY

J. Wayne Keyes May 1985 35 p refs

(NASA-TM-86368; L-15674; NAS 1.15:86368) Avail: NTIS HC A03/MF A01 CSCL 01A

The nozzle test chamber was modified to provide a high-pressure-ratio nozzle static-test capability. Experiments were conducted to determine the range of the ratio of nozzle total pressure to chamber pressure and to make direct nozzle thrust measurements using a three-component strain-gage force balance. Pressure ratios from 3 to 285 were measured with several axisymmetric nozzles at a nozzle total pressure of 15 to 190 psia. Devices for measuring system mass flow were calibrated using standard axisymmetric convergent choked nozzles. System mass-flow rates up to 10 lbm/sec are measured. The measured thrust results of these nozzles are in good agreement with one-dimensional theoretical predictions for convergent nozzles. E.A.K.

N85-25217# Naval Postgraduate School, Monterey, Calif.

A COMPUTER PROGRAM TO CALCULATE THE SUPERSONIC FLOW OVER A SOLID CONE IN AIR OR WATER M.S. Thesis

P. W. Hughes Jun. 1984 117 p

(AD-A151102; NPS67-84-007) Avail: NTIS HC A06/MF A01 CSCL 20/4

The computer program calculates the supersonic flow over a cone in air or water. The main objective is to calculate the cone semi-vertex angle given prescribed initial conditions. The program is written in structured FORTRAN and implements Busemann's graphical integration technique. Supersonic flow over a cone in water is useful as a good first approximation to the motion of the metal jet from an explosive shaped-charge fired underwater. A typical result for supersonic flow over a cone in water is as follows: given an upstream temperature, 323.16 upstream pressure, 1 bar; shock angle, 20.0 deg, and pressure behind the shock front, 5 kilobars, the cone semi-vertex angle is calcuated to be 7.23 deg. Generally, pressures involved in water flow are much larger than for air flow, and the cone semi-vertex angles for water flow are smaller than for air flow. GRA

N85-25218# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.

UNSTEADY GAS DYNAMICS PROBLEMS RELATED TO FLIGHT VEHICLES Final Report, 1 Apr. 1979 - 31 Mar. 1984

H. Ashley May 1984 10 p

(Grant AF-AFOSR-0061-79)

(AD-A151187; AFOSR-85-0166TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

This report summarizes research efforts in unsteady aerodynamics and aeroelasticity. GRA

N85-25219# Naval Postgraduate School, Monterey, Calif.

DESIGN OF APPARATUS FOR THE DETERMINATION OF AERODYNAMIC DRAG COEFFICIENTS OF AUTOMOBILES M.S. Thesis

B. R. Gritte Jun. 1984 80 p

(AD-A151842) Avail: NTIS HC A05/MF A01 CSCL 20/4

There are three major components of the total resistance to motion of road vehicles: aerodynamic drag, rolling resistance in the form of tire friction on road surfaces and mechanical resistance in the form of bearing friction. Apparatus constructed at the naval Postgraduate School, Monterey, CA, employs the measurement of total drag (aerodynamic drag + rolling resistance drag + mechanical drag) by means of coastdown testing and the measurement of rolling resistance and mechanical drag in an aerodynamic shielding trailer to determine the aerodynamic drag. Data acquisition and reduction is carried out with a portable dedicated minicomputer system. The apparatus is designed to yield drag coefficients with an estimated uncertainty of about one percent. GRA

N85-25173# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik.

TRANSONIC PRESSURE DISTRIBUTIONS ON A TWO-DIMENSIONAL 0012 AND SUPERCRITICAL MBB-A3 PROFILE OSCILLATING IN HEAVE AND PITCH

H. Tiebstein and R. Voss *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 24 p refs (For primary document see N85-25171 15-01)

Avail: NTIS HC A14/MF A01

N85-25174# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

NUMERICAL STUDIES OF UNSTEADY TRANSONIC FLOW OVER OSCILLATING AIRFOIL

W. J. Chyu and S. S. Davis *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 22 p refs Document previously announced as N83-12316 (For primary document see N85-25171 15-01)

Avail: NTIS HC A14/MF A01 CSCL 01A

N85-25175# National Aerospace Lab., Amsterdam (Netherlands).

ANALYSIS OF TRANSONIC AERODYNAMIC CHARACTERISTICS FOR A SUPERCRITICAL AIRFOIL OSCILLATING IN HEAVE, PITCH AND WITH OSCILLATING FLAP

R. C. denBoer and R. Houwink *In* AGARD Transonic Unsteady

Aerodyn. and its Aeroelastic Appl. Jan. 1985 15 p refs Sponsored in part by Netherlands Agency for Aerospace Programs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

N85-25176*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. Unsteady Aerodynamics Branch.
EXPERIENCE WITH TRANSONIC UNSTEADY AERODYNAMIC CALCULATIONS
J. W. Edwards, S. R. Bland, and D. A. Seidel *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 21 p refs Document previously announced as N84-32353 (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01 CSCL 01A

N85-25177# Royal Aircraft Establishment, Farnborough (England).
CALCULATION OF HARMONIC AERODYNAMIC FORCES OF AEROFOILS AND WINGS FROM THE EULER EQUATIONS
Deborah J. Salmond *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 17 p refs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

N85-25178# Office National d'Etudes et de Recherches Aerospatiales, Leclerc (France).
CALCULATION OF UNSTEADY TRANSONIC SEPARATED FLOWS BY VISCOUS-INVISCID INTERACTION
P. Girodroux-Lavigne and J. C. LeBalleur *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 18 p refs In FRENCH; ENGLISH summary Original document previously announced as A85-12621 (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

N85-25179# British Aerospace Aircraft Group, Woodford (England).
A SEMI-EMPIRICAL UNSTEADY TRANSONIC METHOD WITH SUPERSONIC FREE STREAM
M. J. Green and D. Lambert *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 16 p refs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

N85-25180# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STATUS AND PROSPECTS OF COMPUTATIONAL FLUID DYNAMICS FOR UNSTEADY TRANSONIC FLOW
W. J. McCroskey (Army Aeromechanics Lab.), P. Kutler, and J. C. Bridgman *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 24 p refs Document previously announced as N85-12037 (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01 CSCL 20D

N85-25181# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
IMPROVEMENT AND EXTENSION OF A NUMERICAL PROCEDURE FOR THE THREE DIMENSIONAL UNSTEADY TRANSONIC FLOWS
Pierre Mulak and Jean-Jacques Angelini *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 12 p refs In FRENCH; ENGLISH summary (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

N85-25183# Lockheed-Georgia Co., Marietta.
COMPUTATION OF UNSTEADY TRANSONIC FLOWS ABOUT TWO-DIMENSIONAL AND THREE-DIMENSIONAL AGARD STANDARD CONFIGURATIONS
J. B. Malone, S. Y. Ruo, and N. L. Sankar (Georgia Inst. of Tech.) *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 14 p refs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

N85-25184# Dassault-Breguet Aviation, St. Cloud (France).
CALCULATION OF UNSTEADY TRANSONIC FLOW AROUND A HIGH SWEPT WING
A. Laurent *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 24 p refs In FRENCH; ENGLISH summary (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

N85-25185*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
UNSTEADY TRANSONIC AERODYNAMIC AND AEROELASTIC CALCULATIONS ABOUT AIRFOILS AND WINGS
Peter M. Goorjian and Guru P. Guruswamy (Informatics General Corp., Palo Alto, Calif.) *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 31 p refs Document previously announced as N84-31092 (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01 CSCL 20D

N85-25187# National Aerospace Lab., Tokyo (Japan).
THE DEVELOPMENT OF UNSTEADY TRANSONIC 3-D FULL POTENTIAL CODE AND ITS AEROELASTIC APPLICATIONS
Koji Isogai *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 25 p refs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

N85-25602# Joint Publications Research Service, Arlington, Va.
MERCEDES-BENZ AUTO 2000 ACHIEVES LOW DRAG COEFFICIENT
Albert Hack and Ruediger Faul *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-007) 21 Feb. 1984 p 5-9 Transl. into ENGLISH from Automobil Ind. (Wuerzburg, West Germany), Sep. 1983 p 379-385 (For primary document see N85-25600 15-31)
Avail: NTIS HC A03/MF A01

N85-26303# Joint Publications Research Service, Arlington, Va.
NUMERICAL ANALYSIS OF SUPERSONIC REACTIVE FLOW IN WAKE OF REVERSE STEP Abstract Only
N. N. Yanenko and V. I. Golovichev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 4 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk, USSR), v. 20, no. 4, Jul. - Aug. 1984 p 52-56 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

N85-26304# Joint Publications Research Service, Arlington, Va.
NUMERICAL MODELING OF GAS DYNAMIC PHENOMENA DURING SUPERSONIC FLOW OF VISCOUS GAS IN CHANNEL WITH ELECTRICAL FLOW DISCHARGE Abstract Only
P. A. Voynovich, B. M. Dymshits, and A. A. Fursenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 5-6 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 15, 12 Aug. 1984 p 908-911 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N85-25220*# Operations Research, Inc., Rockville, Md.
INVESTIGATION OF TECHNOLOGY NEEDS FOR AVOIDING HELICOPTER PILOT ERROR RELATED ACCIDENTS Final Report

Richard I. Chais and William E. Simpson Washington NASA Jun. 1985 54 p
(Contract NASw-3554)
(NASA-CR-3895; NAS 1.26:3895; ORI-TR-2384) Avail: NTIS HC A04/MF A01 CSCL 01C

Pilot error which is cited as a cause or related factor in most rotorcraft accidents was examined. Pilot error related accidents in helicopters to identify areas in which new technology could reduce or eliminate the underlying causes of these human errors were investigated. The aircraft accident data base at the U.S. Army Safety Center was studied as the source of data on helicopter accidents. A randomly selected sample of 110 aircraft records were analyzed on a case-by-case basis to assess the nature of problems which need to be resolved and applicable technology implications. Six technology areas in which there appears to be a need for new or increased emphasis are identified. E.A.K.

N85-25221# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATION(S), A-84-128 THROUGH -133
29 Nov. 1984 5 p
(Rept-3996C/41) Avail: NTIS HC A02/MF A01

On January 13, 1984, Pilgrim Airlines Flight 35, a Fokker F-27-100 (N148PM), crashed on runway 4-L at John F. Kennedy International Airport, Jamaica, New York, shortly after takeoff. Following takeoff, at about 100 feet above the ground, the No. 1 engine autofeathered followed within seconds by a loss of power in the No. 2 engine. The airplane rapidly lost altitude and crashed on the runway and slid about 1,200 feet before coming to rest. There was no fire. The flight attendant sustained a spinal fracture, and the captain and 13 passengers sustained minor injuries. The first officer and 8 passengers, including a 3-month-old infant and a 2 1/2-year-old-child were not injured. The National Transportation Safety Board's investigation of the accident identified several conditions which adversely affected the postcrash evacuation of the crew and passengers. It also found that information contained in the flight attendant's manual was imprecise, incomplete, or inappropriate. These safety hazards were not uncovered during the FAA airworthiness and operating certification inspections of this airplane in connection with the airplane being brought into U.S. registry. The Board believes that FAA operations and maintenance inspectors should increase their surveillance and review their procedures. A.R.H.

N85-25222# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATION(S), A-84-123 AND -124
16 Nov. 1984 7 p refs
(Rept-3894B/93) Avail: NTIS HC A02/MF A01

On February 28, 1984, Scandinavian Airlines System (SAS) Flight 901, a McDonnell Douglas DC-10-30 of Norwegian Registry, was a regularly scheduled international passenger flight from Stockholm, Sweden, to John F. Kennedy International Airport (JFK), New York. Following a category 2 instrument landing system approach to runway 4 right at JFK, the airplane touched down long and fast after which it rolled off the end of the runway and came to rest with its nose partially submerged in a tidal waterway about 600 feet beyond the departure end of the runway. The 163 passengers and 14 crewmembers evacuated the airplane safely, but with some injuries. The Safety Board determined that the probable cause of this accident was the flightcrew's: (1) disregard for prescribed procedures for monitoring and controlling of airspeed during the final stages of the approach; (2) decision to continue the landing rather than to execute a missed approach; and (3) overreliance on the autothrottle speed control system which had a history of recent malfunctions. A.R.H.

N85-25223# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATION(S), A-84-96
15 Aug. 1984 4 p refs
(Rept-3983A/217) Avail: NTIS HC A02/MF A01

About 0514 eastern standard time, on March 30, 1983, Central Airlines Flight 27, a Gates Learjet model 25, crashed during a landing attempt on runway 4 right at Newark International Airport, Newark, New Jersey. Flight 27 was operating as a nonscheduled cancelled bank check courier under 14 CFR Part 135. The airplane was destroyed on impact and the two pilots died as a result of the accident. Toxicological testing done on mucous membrane specimens of both pilots indicated that they had used or been exposed to marijuana within the past 24 hours. In addition, gas chromatography/mass spectrometry testing on the urine of the pilot in command revealed a delta-9-THC level comparable to marijuana use within the previous 24 to 48 hours. The National Transportation Safety Board determined that the probable cause of this accident was: (1) the loss of control following ground contact; (2) an unstabilized approach; and (3) likely impairment of the flightcrew's judgment, decisionmaking, and flying abilities by a combination of physiological and psychological factors. G.L.C.

N85-25224# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATION(S), A-84-76 THROUGH -78
12 Jul. 1984 4 p
(Rept-3751E) Avail: NTIS HC A02/MF A01

The National Transportation Safety Board has completed its investigation of the accident involving Air Canada Flight 797, which occurred on June 2, 1983, when an in-flight fire forced the flightcrew of the McDonnell Douglas DC-9 airplane to make an emergency landing at the Greater Cincinnati Airport. Upon landing, a flash fire occurred in the cabin. The five crewmembers and 18 passengers were able to evacuate the burning cabin; the remaining 23 passengers died in the fire. The Safety Board's investigation has determined that the fire propagated through the airplane's left rear lavatory, but was unable to identify positively the source of ignition. G.L.C.

N85-25225# Ametek, Santa Barbara, Calif. Offshore Research and Engineering Div.
AIRCRAFT SKIN PENETRATOR AND AGENT APPLICATOR. VOLUME 2: TEST AND EVALUATION Final Report, 17 Sep. 1982 - 15 Mar. 1983
R. H. Cuthbertson Tyndall AFB, Fla. Air Force Engineering and Services Center Nov. 1984 33 p
(Contract F08635-82-C-0472)
(AD-A151609; AFESC/ESL-TR-84-12-Vol-2) Avail: NTIS HC A03/MF A01 CSCL 13/12

The need for development of the tool evolved from the fact that current USAF firefighting equipment does not provide rapid access to aircraft fires occurring in airframe voids where access ports are either limited or not provided. This report covers development and construction of an aircraft skin penetrator device to provide rapid penetration and allow placement of a suitable fire suppressing agent onto the base of an aircraft fire. Volume 1 discusses in detail the research conducted on the development of the proposed working model of the Aircraft Skin Penetrator/ Agent Applicator. The report contains photographs of the different concepts considered. Volume 2 has detailed drawings showing the construction of the working model Penetrator and sketches which show how the Penetrator may be used to fight aircraft fires. GRA

N85-25226# Systems Research Labs., Inc., Dayton, Ohio.
PRELIMINARY DESIGN OF A LIMB RESTRAINT EVALUATOR Final Report
R. P. White, Jr., T. W. Gustin, and M. C. Tyler Dec. 1984 132 p
(Contract F33615-81-C-0500)
(AD-A151749; AFAMRL-TR-84-042) Avail: NTIS HC A07/MF A01 CSCL 06/7

This report summarizes the results of mechanical and instrumentation design studies conducted to formulate the preliminary design of a system to measure the effectiveness of various limb restraint systems during wind tunnel, rocket sled, or laboratory tests. The system is to be integrated into an anthropometric test dummy designated the Limb Restraint Evaluator (LRE). Mechanical design considerations include anthropometry, joint articulation,

structural strength, the usability of available commercial components, and sensor selection and placement. The instrumentation will have a total capability of 96 channels of data, including 52 LRE parameters involving limb joint rotation, knee joint loads, forces and moments developed at the neck and forearm, and torso accelerations. The system will also be capable of recording data from up to 26 transducers mounted on the ejection seat. The major conclusion is that a successful limb restraint evaluator can be designed and constructed, using current state-of-the-art techniques and many existing components from anthropomorphic dummies, to survive the extreme environmental conditions to which it will be exposed, and to accurately evaluate the effectiveness of various limb restraint devices in preventing limb flailing during aircraft ejections. GRA

N85-25227# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MICROCOMPUTER APPLICATION OF AEROSPACE ASSET SURFACE SEARCH PLANNING M.S. Thesis
D. R. Douglas 14 Dec. 1984 133 p
(AD-A151833; AFIT/GSO/MATH/84D-1) Avail: NTIS HC A07/MF A01 CSCL 06/7

This thesis tackles the most time-consuming and complicated type of search and recovery planning -- calculating the approximate surface position of an aerospace object which has been affected over time by glide or parachutes winds aloft, as well as surface current winds, leeway drift, and sea current vectors. They have been tested on a small, portable 64K memory, Z-80A processor-based microcomputer (Osborne One), a Convergent Technologies C-3 Data System, and a Digital Equipment Corporation VAX 11-780 mainframe. Search and Rescue/Recovery (SAR) in the United States is based on the humanitarian principle which compels people to render aid to those in distress. Search planning guidelines and formulae to help locate persons in distress or missing aerospace objects are described in the National Search and Rescue Manual (AFM 84-2). This method has not been previously implemented for microcomputers in a compiled, transportable programming language like Pascal. The reader must have a solid understanding of SAR method before using this software package to assist in making decisions where human life is at risk. GRA

N85-25228# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN APPROACH TO PLANNING IN THE INFLIGHT EMERGENCY DOMAIN M.S. Thesis
D. L. Knode Dec. 1984 121 p
(AD-A151869; AFIT/GCS/ENG/84D-15) Avail: NTIS HC A06/MF A01 CSCL 06/4

A planner must understand its domain and be able to effectively reason about interacting goals competing for satisfaction in its environment. Current artificial intelligence (AI) planning structures are inadequate for expert and common sense reasoning in the dynamic aircraft inflight emergency domain. These current planners are inadequate because they are not designed to manipulate multiple goals in an unpredictable environment. Conflicting goals, i.e., when the realization of one goal interferes with the realization of another goal, poses particularly frustrating problems for typical planners. Like the everyday activities domain, the flight domain requires a large pool of world and common sense information. It also requires flight domain information and knowledge of the goals of its pilots and other aircrew members. The planner for an intelligent pilot aid (PIPA) divides planning into four activities: (1) goal detection, (2) plan proposition, (3) plan projection, and (4) execution; composed into four components with similar names. Goals are associated with the observations which trigger them, and plans are associated with the goals to which they apply. Proposed plans are simulated in a hypothetical model of current states and are watched for weakness, overlap, or conflict. Overlapping plan steps are approximately combined, while conflicts direct the PIPA to either prospose and test plans or have the PIPA attempt to change the circumstances surrounding the conflict. GRA

N85-25229# Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION
25 May 1985 56 p Transl. into ENGLISH from various Russian articles
(JPRS-UTR-84-014) Avail: NTIS HC A04/MF A01

An overview of various aspects of the Soviet transportation industry are presented. Topics discussed include: (1) civil aviation; (2) motor vehicles and highways; (3) rail systems; (4) maritime and river fleets; and (5) intersector network development. For individual titles, see N85-25230 through N85-25231.

N85-25230# Joint Publications Research Service, Arlington, Va.
DESIGNER O. K. ANTONOV ON NEW AN-74 ARCTIC TRANSPORT
O. K. Antonov and T. Kuznetsova *In its* USSR Rept.: Transportation (JPRS-UTR-84-014) 25 May 1985 p 1-3 Transl. into ENGLISH from Pravda Ukr. (Kiev), 22 Mar. 1984 p 4 (For primary document see N85-25229 15-03)
Avail: NTIS HC A04/MF A01

A brief non-technical overview of the Antonov AN-74 aircraft is presented. The AN-74 is designed for operation in the Arctic and Antactic regions. G.L.C.

N85-25231# Joint Publications Research Service, Arlington, Va.
ILYUSHIN BUREAU DESIGNER ON FUEL CONSERVATION RESEARCH
G. Novozhilov *In its* USSR Rept.: Transportation (JPRS-UTR-84-014) 25 May 1985 p 4-5 Transl. into ENGLISH from Vozdushnyy Transp. (Moscow), 5 Apr. 1984 p 2 (For primary document see N85-25229 15-03)
Avail: NTIS HC A04/MF A01

Measures aimed at reducing the overall expenditure of aviation fuel by aeroflot were examined. Topics mentioned included: (1) economical flight profiles; (2) selection of rational take-off and landing course; (3) optimal plans for plane steering at airports; (4) utilization of straight plane routes; and (5) decreasing engine idle time while planes are on the ground. Part of the task was solved by a mathematical-economic model employing the use of a computer. G.L.C.

N85-25191# Joint Publications Research Service, Arlington, Va.
OFFICIAL ON SOVIET RESEARCH IN DEICING TECHNIQUES
In its USSR Rept.: Transportation (JPRS-UTR-85-008) 3 May 1985 p 22-24 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 19 Feb. 1985 p 3 (For primary document see N85-25189 15-01)
Avail: NTIS HC A05

N85-25194# Joint Publications Research Service, Arlington, Va.
CIVIL AIR CODE INTERNATIONAL FLIGHTS SECTION EXPLAINED
A. Zinevich *In its* USSR Rept.: Transportation (JPRS-UTR-84-015) 31 May 1984 p 5-9 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 3, Mar. 1984 p 32-33 (For primary document see N85-25192 15-01)
Avail: NTIS HC A03

N85-25199# Joint Publications Research Service, Arlington, Va.
EFFECTS OF LIGHTNING ON AIRCRAFT STUDIED AT SHEREMETYEVO
L. Tsesarkin and Oleg Konstantinovich Trunov *In its* USSR Rept.: Transportation (JPRS-UTR-84-017) 13 Jun. 1984 p 16-18 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 31 Mar. 1984 p 4 (For primary document see N85-25196 15-01)
Avail: NTIS HC A04/MF A01

N85-26602*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AIRCRAFT SAFETY IMPROVEMENT
Gloria Kao *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 69-74 (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 01C

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N85-25232 British Aerospace Dynamics Group, Bristol (England). Guidance and Control Dept.
NON-LINEAR METHODS FOR INERTIAL NAVIGATION SYSTEM ALIGNMENT
Norman Swift Dec. 1981 32 p refs
(BAe-BT-12683) Copyright. Avail: Issuing Activity

The mathematical results required to implement methods for treating the bilinear dynamic equations and quadratic measurement equations arising in aligning a slave inertial navigation system to a reference system are presented. The bilinearity can be treated exactly using results from stochastic calculus. The measurement equations can be treated in two ways: a particular form for the probability density function of the alignment errors may be assumed and spherical harmonic functions can be used to derive the filter equations without further approximations; the state vector describing the alignment errors may be extended to include the quadratic terms; the differential equations for these are bilinear and the measurement equations are linear. Author (ESA)

N85-25233 British Aerospace Dynamics Group, Bristol (England). Guidance and Control Dept.
ASSESSMENT OF A NONLINEAR METHOD OF INS ALIGNMENT
Norman Swift Dec. 1981 37 p refs
(BAe-BT-12684) Copyright. Avail: Issuing Activity

A procedure that aligns a slave inertial navigation system to a reference system using only the normally available measurements of angular velocity and linear acceleration is presented. The algorithm is recursive and takes into account the bilinear nature of the system dynamic equations and the nonlinearity inherent in the measurement equations. Convergence to the correct alignment is shown to be slower than can be achieved with linear filters. A method of speeding up convergence is suggested. Author (ESA)

N85-25234 British Aerospace Dynamics Group, Bristol (England). Guidance and Control Dept.
IMPLEMENTATION OF AN INERTIAL NAVIGATION ALGORITHM USING A LIMITED WORDLENGTH MICROPROCESSOR FOR A STRAPDOWN NAVIGATION COMPUTER
A. G. Moreton Jan. 1982 55 p refs
(BAe-BT-12792) Copyright. Avail: Issuing Activity

An inertial navigation (IN) algorithm consisting of an attitude algorithm, which calculates the values of the quaternions and the Euler angles, and a navigation algorithm, which calculates the velocity and position of the instruments was implemented on a TI 9900 microprocessor. Error due to the integration approximation is shown to be small compared with errors such as time delays. A simulation to test the drift rate on the IN variables show that after 20 min the error due to the implementation of the algorithm by a limited wordlength microprocessor is of the order 1.8 km for position and 4.0 m/sec for velocity. These errors are of the order expected. Author (ESA)

N85-25235# Federal Aviation Administration, Washington, D.C.
RESPONSE TO NAS PLAN AUDIT REPORT RECOMMENDATIONS Final Report
Vince Chu and Jack Loewenstein Mar. 1985 123 p
(FAA/ES-85-1; FAA/SES) Avail: NTIS HC A06/MF A01

The disposition of recommendations to FAA to minimize risk associated with modernizing the National Airspace System as contained in section 6 of the NAS Plan Audit Report of August 1984 is presented. Areas covered include: integration findings, plan project findings, terminal systems, flight service systems, ground-to-air interfacility communication system, and maintenance and operational system support. A.R.H.

N85-25236# Systems Control Technology, Inc., West Palm Beach, Fla.
HELICOPTER USER SURVEY: TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS) Final Report, Oct. 1983 - Feb. 1985
F. R. Taylor and R. J. Adams Apr. 1985 97 p refs
(Contract DTFA-80-C-10080)
(FAA-PM-85-6) Avail: NTIS HC A05/MF A01

The data collection methodology, and the results obtained from the Traffic Alert and Collision Avoidance System (TCAS) User Survey are described. Helicopter operator and pilot responses were examined in three particular areas of interest: (1) the nature of helicopter near mid-air collision encounters; (2) pilot display preferences; and (3) user price thresholds for a helicopter TCAS. The survey reveals that only a small percentage of near mid-air collisions involving helicopters are reported, although pilots assert tht mid-air collisions pose a significant hazard to flight safety. Significant characteristics of helicopter operations and their associated NMAC hazards which should be addressed in the design of a helicopter specific TCAS are broken down, according to operator group. A.R.H.

N85-25237*# Honeywell, Inc., St. Louis Park, Minn. Military Avionics Div.
ROTORCRAFT DIGITAL ADVANCED AVIONICS SYSTEM (RODAAS) FUNCTIONAL DESCRIPTION
Eric M. Peterson, Jim Bailey, and Tom J. McManus Jan. 1985 188 p
(Contract NAS2-11695)
(NASA-CR-166611; NAS 1.26:166611) Avail: NTIS HC A09/MF A01 CSCL 01D

A functional design of a rotorcraft digital advanced avionics system (RODAAS) to transfer the technology developed for general aviation in the Demonstration Advanced Avionics System (DAAS) program to rotorcraft operation was undertaken. The objective was to develop an integrated avionics system design that enhances rotorcraft single pilot IFR operations without increasing the required pilot training/experience by exploiting advanced technology in computers, busing, displays and integrated systems design. A key element of the avionics system is the functionally distributed architecture that has the potential for high reliability with low weight, power and cost. A functional description of the RODAAS hardware and software functions is presented. E.A.K.

N85-25238# Federal Aviation Administration, Washington, D.C.
NATIONAL AIRSPACE REVIEW. IMPLEMENTATION PLAN. REVISED
Jan. 1985 51 p
(AD-A151412) Avail: NTIS HC A04/MF A01 CSCL 17/7

Since the summer of 1982, the Federal Aviation Administration (FAA) has been hosting task group working sessions of the National Airspace Review (NAR). The NAR is a cooperative venture by the aviation industry and government. The NAR is comprehensively reviewing current air traffic control procedures, flight regulations, and airspace for the purpose of validating the current system or identifying near-term changes which will promote greater efficiency. As a component of the National Airspace System Plan, the NAR will provide the operational framework for moving into the next generation National Airspace System. In the area of procedures, task groups have covered: terminal services, weather programs, traffic flow management, helicopter operations, separation standards and the national Flight Data System. In the regulations area, task groups have covered: regulated terminal airspace areas, and some aspects of airways and routes establishment and revocation. In the area of airspace task groups have covered: terminal and en route airspace configuration, routes, United States/Canada/Mexico interface, charts, Air Route Traffic Control Center infrastructure, and airspace reclassification. Study areas remaining to be reviewed are FAA Handbooks, several

regulatory areas, and international airspace. Working sessions covering these areas will extend to the fall of 1984. GRA

N85-25239# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
GLOBAL POSITIONING SYSTEM: A MODIFICATION TO THE BASELINE SATELLITE CONSTELLATION FOR IMPROVED GEOMETRIC PERFORMANCE M.S. Thesis
D. W. Thomin Dec. 1984 210 p
(AD-A151692; AFIT/GA/ENG/84D-4) Avail: NTIS HC A10/MF A01 CSCL 17/7

This investigation determined the effect of changes in eccentricity to the orbits of the proposed Global Positioning System (GPS) 18-satellite baseline constellation by analyzing the geometric performance obtained. The effect of satellite losses upon global coverage was also examined with an emphasis on determining which combination of remaining satellites provided the best and worst cases. The potential of GPS for navigation of the space-based user was explored by analyzing the geometric performance obtained for a variety of user trajectories and GPS antenna beamwidths. A computer program which analyzes the many aspects of the geometric performance of pseudoranging navigation satellite systems was used. The results of this analysis indicate that a simple modification to the baseline constellation could reduce outages on a global basis by nearly 50%. The modification consists of changing the shape of the GPS circular satellite orbits to slightly elliptical ones, resulting in more favorable satellite geometry and fewer outages to the user on a global average. Degradation of coverage due to satellite losses was found to be largely dependent on the combination of the remaining satellites which suggests that rephasing of the remaining satellites could significantly improve the degraded performance. The potential for conventional use of GPS for navigation in space was shown to exist for the low altitude user but will be very limited for the higher altitude user due to present GPS antenna design. GRA

N85-25240# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
INVESTIGATION OF A FAILURE DETECTION/IDENTIFICATION SYSTEM FOR A TACTICAL AIRCRAFT NAVIGATION SYSTEM M.S. Thesis
G. R. Johnston Dec. 1984 312 p
(AD-A151846; AFIT/GE/ENG/84D-36) Avail: NTIS HC A14/MF A01 CSCL 17/7

The purpose of this thesis was to develop a suitable filter model and failure detection/identification (FDI) processor as a basis for a fully simulated adaptive tactical navigation (ATN) system. A 52-state truth error model was developed from which a 26-state filter error model was derived. The measurement process uses a six measurement satellite positioning system (three velocity measurements and three position measurements), a three measurement Doppler radar, and a terrain correlation system. The filter residuals for the different measurement processes are then used in N-step likelihood function computations to observe the residual behavior. Two different testing criteria have been developed for failure declaration. Simple threshold establishment and the tracking of the likelihood function N-step characteristics are used for this purpose. Based on the statistics of the observed failure characteristics, an isolation processor isolates the fault and makes the correct identification. GRA

N85-25241# Royal Signals and Radar Establishment, Malvern (England).
CALCULATION AND DISPLAY OF STACK DEPARTURE TIMES FOR AIRCRAFT INBOUND TO HEATHROW AIRPORT
J. O. Cook 31 Aug. 1984 17 p
(AD-A151991; RSRE-MEMO-3750; BR94334) Avail: NTIS HC A02/MF A01 CSCL 01/5

The accurate calculation of delays to be absorbed by inbound aircraft is difficult in a manual Air Traffic Control environment. However, when flight plan information is computerized with adequate on-line data - transfer facilities, the problem may be solved. This memorandum suggests a way of automating and displaying to Air Traffic Controllers information about strategies for absorbing aircraft delays. Adoption of the proposed methods would have advantages for pilots, airline operators and Air Traffic Controllers. GRA

N85-25193# Joint Publications Research Service, Arlington, Va.
ADMINISTRATION CHIEF ON AIR TRAFFIC CONTROL IMPROVEMENTS
A. Kolesnikov *In its* USSR Rept.: Transportation (JPRS-UTR-84-015) 31 May 1984 p 1-4 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 3, Mar. 1984 p 30-31 (For primary document see N85-25192 15-01)
Avail: NTIS HC A03

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-25242 Technische Geraete und Entwicklungsgesellschaft m.b.H., Klagenfurt (Austria).
FLYING OBJECTS Patent [FLUGKOERPER]
Heinz Jordan Bern Swiss Patent Office Issued 15 Feb. 1983 9 p In GERMAN Filed 23 Oct. 1978, Priority Dates 31 Oct. 1977 at AT 7749/77, 13 Jun. 1978 at AT 4309/78, 13 Jun. 1978 at AT 4310/78
(CH-634516-A5; Intl-Cl.B64C-39/06; Intl-Cl-A63H-27/02) Avail: Swiss Patent Office

A flying object with especially good stability and economic properties and with the highest possible safety was developed. It is an axially symmetrical airship with, inside, a coaxial rotatable propulsion system supported on bearings. There is a control part and/or a cockpit to take a load. The airship is driven by the restoring torque produced by the propulsion system, in a direction opposite to that of the propulsion system. The control part and/or the cockpit are rotatably supported on bearings with respect to the airship and the propulsion system, and is stationary during the flight. Author (ESA)

N85-25243 Eidgenoessische Technische Hochschule, Grosshesselohe (West Germany).
AIRFOIL WING WITH FLAP Patent [TRAGFLUEGEL MIT KLAPPE]
Burkhart Grob, Ernst Gegenhuber, and Ekkehard Bretting Bern Swiss Patent Office Issued 28 Feb. 1983 7 p In GERMAN Filed 29 Jan. 1979, Priority Date 1 Feb. 1978 at DE 2804254
(CH-634787-A5; Intl-Cl.B64C-3/50) Avail: Swiss Patent Office

An airfoil wing with a mobile flap on bearings was developed. On the upper side of the wing the outer cover of the plane reference area is connected to the outer cover of the flap via a thin flexible direct diaphragm. Cam slideways serve as bearings for the flap; they guide the point of support of the diaphragm at the flap approximately along a spiral trajectory around the point of support of the diaphragm at the plane reference area. By this measure stray flows unfavorably affecting the wing forces are avoided. Author (ESA)

N85-25244 Groupement d'Etudes et de Promotion pour Avions Legers, Paris (France).
AIRCRAFT STRUCTURE FOR APPLICATION TO TRAINING AIRCRAFT Patent [CELLULE D'AVION NOTAMMENT D'UN AVION D'ENTRAINEMENT]
Raymond Richoux, Jacques Lemacon, and Jean Rene Parmentier Bern Swiss Patent Office Issued 31 Mar. 1983 15 p In FRENCH Filed 31 Mar. 1980, Priority Date 27 Mar. 1979 at FR 79 07587
(CH-635286-A5; Rept-2514/80; Intl-Cl.B64C-1/00; Intl-Cl.B64C-3/14) Avail: Swiss Patent Office

An aircraft structure designed using symmetrical elements, such that most of the left and right half wings are interchangeable is

described. The design shows a cost advantage since the number of different elements required is about half. The design requires the utilization of symmetrical wing profiles such as NACA00 or a slight variation, the NACA23000 which can be obtained from the NACA00 by changing the leading edge. Author (ESA)

N85-25245 United Technologies Corp., East Hartford, Conn.
HELICOPTER ROTOR Patent [HUBSCHRAUBERROTOR]
Donald Leroy Ferris, William Lawrence Noehren, and Peter Chase Ogle Bern Swiss Patent Office Issued 31 Aug. 1983 6 p In GERMAN Filed 9 Jul. 1979, Priority Date 12 Jul. 1978 at US 924110
(CH-637890-A5; Intl-Cl.B64C-27/35) Avail: Swiss Patent Office

A helicopter rotor was developed. It has a flexible beam fixed to the rotor hub and extending radially opposite the hub. The beam carries a rotor blade at each end. A torque tube enclosing the beam extends radially inside from each rotor blade. There is an elastomer damper between the radial inner end of the torque tube and the beam. An inner plate of the damper is placed in a fixation part which is glued to the beam via an elastomer layer, in order that this damper can be simply replaced and remain connected to the beam during all blade motions. The fixation avoids motion of the inner plate in the transversal direction and radially outwards with respect to the beam, but allows a radial inward motion. An outer plate of the damper is fixed to the torque tube by a fast releasable and rebuildable screw joint. Author (ESA)

N85-25246 Kfoury (Elie Philippe), Cairo (Egypt).
AIRCRAFT Patent [FLUGZEUG]
Elie Philippe Kfoury Bern Swiss Patent Office Issued 30 Apr. 1984 6 p In GERMAN Filed 29 Feb. 1980
(CH-642598-A5; Intl-Cl.B64C-29/00) Avail: Swiss Patent Office

A aircraft which is much easier to control than a helicopter was developed. The aircraft consists of parts arranged one after another and having about the same length and width. The front and back parts have the same average height; the middle part is higher and is designed as a cockpit with windows. The front and back parts are honeycombed from top to bottom by tubular channels in which driven lifting propellers are arranged which suck air from the top and blow it away at the bottom, producing drive. A thrust propeller with variable blade pitch produces a forward and backward thrust. Author (ESA)

N85-25247*# Sikorsky Aircraft, Stratford, Conn.
DESIGN, FABRICATION AND TEST OF COMPOSITE CURVED FRAMES FOR HELICOPTER FUSELAGE STRUCTURE
D. W. Lowry, N. E. Krebs, and A. L. Dobyns Oct. 1984 111 p refs
(Contract NAS1-16826)
(NASA-CR-172438; NAS 1.26:172438; SER-510145) Avail: NTIS HC A06/MF A01 CSCL 01C

Aspects of curved beam effects and their importance in designing composite frame structures are discussed. The curved beam effect induces radial flange loadings which in turn causes flange curling. This curling increases the axial flange stresses and induces transverse bending. These effects are more important in composite structures due to their general inability to redistribute stresses by general yielding, such as in metal structures. A detailed finite element analysis was conducted and used in the design of composite curved frame specimens. Five specimens were statically tested and compared with predicted and test strains. The curved frame effects must be accurately accounted for to avoid premature fracture; finite element methods can accurately predict most of the stresses and no elastic relief from curved beam effects occurred in the composite frames tested. Finite element studies are presented for comparative curved beam effects on composite and metal frames. E.A.K.

N85-25248*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLIGHT INVESTIGATION OF STALL, SPIN AND RECOVERY CHARACTERISTICS OF A LOW-WING, SINGLE-ENGINE, T-TAIL LIGHT AIRPLANE
H. Paul Stough, III, Daniel J. DiCarlo, and James M. Patton, Jr. May 1985 98 p refs
(NASA-TP-2427; L-15868; NAS 1.60:2427) Avail: NTIS HC A05/MF A01 CSCL 01C

Flight tests were performed to investigate the stall, spin, and recovery characteristics of a four-place, low-wing, single-engine, T-tail, general aviation research airplane at an aft center-of-gravity position. Most stalls resulted in roll-offs. Spins were oscillatory in roll and pitch at 43 deg angle of attack; the magnitude of the oscillations was determined by aileron position. Power, flap deflection, and landing gear position did not affect the angle of attack to the spin. Antispin rudder followed by forward wheel with ailerons neutral produced the fastest and most consistent recoveries but the initial application of recovery controls did not always stop a spin. E.A.K.

N85-25249# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
IDENTIFICATION OF DYNAMIC SYSTEMS
R. K. Maine, K. W. Iliff, and R. K. Bogue, ed. Jan. 1985 147 p refs
(AGARD-AG-300-Vol-2; ISBN-92-835-1488-2) Avail: NTIS HC A07/MF A01

The problem of estimating parameters of dynamic systems is addressed. The theoretical basis of system identification and parameter estimations is presented in a manner that is complete and rigorous, yet understandable with minimum prerequisites. Emphasis is on maximum likelihood and related knowledge of stochastic processes or functional analysis. No previous background in statistics is assumed. The treatment emphasizes unification of the various areas in estimation theory and practice. For example, the theory of estimation in dynamic systems is treated as a direct outgrowth of the static system theory. Topics covered include: basic concept and definitions, numerical optimization methods; probability; statistical estimators; estimation in static systems; stochastic processes; state estimation in dynamic systems; output error, filter error, and equation error methods of parameter estimation in dynamic systems; and the accuracy of the estimates. Author

N85-25250*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SIMULATOR STUDY OF THE STALL DEPARTURE CHARACTERISTICS OF A LIGHT GENERAL AVIATION AIRPLANE WITH AND WITHOUT A WING-LEADING-EDGE MODIFICATION
Donald R. Riley May 1985 86 p refs
(NASA-TM-86309; L-15792; NAS 1.15:86309) Avail: NTIS HC A05/MF A01 CSCL 01C

A six-degree-of-freedom nonlinear simulation was developed for a two-place, single-engine, low-wing general aviation airplane for the stall and initial departure regions of flight. Two configurations, one with and one without an outboard wing-leading-edge modification, were modeled. The math models developed are presented simulation predictions and flight-test data for validation purposes and simulation results for the two configurations for various maneuvers and power settings are compared to show the beneficial influence of adding the wing-leading-edge modification. E.A.K.

N85-25251# McDonnell Aircraft Co., St. Louis, Mo.
FIBER OPTICS APPLICATIONS FOR MIL-STD-1760 Final Report, 15 May 1983 - 13 Aug. 1984
G. L. Weinstock and R. Poppitz Wright-Patterson AFB, Ohio AFWAL Oct. 1984 180 p
(Contract F33615-83-C-1004)
(AD-A151113; AFWAL-TR-84-1162) Avail: NTIS HC A09/MF A01 CSCL 01/3

Fiber optics offers attractive design options for information transfer systems with its advances of wide bandwidth and electromagnetic noise immunity. The DOD has recognized these potential benefits by allocating positions in the MIL-STD-1760 Primary Interface Signal Set connector for two future fiber optic bus lines. For several years, users and several connector

manufacturers have been interested in a set of fiber optics contacts interchangeable with size 16 electrical contacts for the MIL-C-38999 connector. Preliminary prototype testing had been sufficiently successful to define a program of full scale qualification for aircraft applications. The result was this contract sponsored by the U.S. Air Force ASD/ENASA with the objective to identify and qualify a set of fiber optics interconnect components which would meet MIL-STD-1760 performance and environmental tests requirements. The program has been successful. A MIL-STD-1760 fiber optics interconnect set has been identified and qualified. Specifications for the component parts and materials have been written. Procedures for fabrication, installation, hardware use, maintenance/repair, and training have been developed. This fiber optics interconnect system is fully qualified and ready for aircraft use. GRA

N85-25252# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
AUTOMATIC DYNAMIC AIRCRAFT MODELER (ADAM), VOLUME 1 Final Report, 1 Mar. - 30 Sep. 1984
H. Griffis Jan. 1985 31 p
(AF Proj. AFSD)
(AD-A151410; ASD-TR-84-5032-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 01/3

This user's manual is a description of the input required for Automatic Dynamic Aircraft Modeler (ADAM). ADAM is designed to generate NASTRAN structural models with minimal data or knowledge. The model generated by ADAM includes the executive, case control, and bulk data decks. The model is setup for eigenvalue analysis with the appropriate plotting commands. Volume 2 and 3 are, respectively, the Demonstrated Problems Manual and the Programmer's Manual. The User's Manual contains the input format and description of variables. GRA

N85-25253# Aeronautical Research Labs., Melbourne (Australia).
CALIBRATION LOADING OF A STRAIN-GAUGED DIVERLESS HELICOPTER WEAPON RECOVERY SYSTEM
M. Heller Jul. 1984 43 p
(AD-A151486; ARL-Struc-TM-386) Avail: NTIS HC A03/MF A01 CSCL 15/5

This memorandum from Australia presents the results of a ground calibration loading test carried out on the Diverless Helicopter Weapon Recovery System (DHWRS). The DHWRS is essentially an aluminum alloy (6061-T6) cage, suspended by a cable from a helicopter, that is used to recover Mk48 torpedoes from the sea. It had been found that some DHWRS used in service had developed cracks at the welds in the aft ring. It was decided that the structural integrity of the DHWRS should be verified. This was done by a calibration loading test to determine the strains for typical loading conditions, and for a load of 24050N, which corresponds to the US Navy static proof load for the acceptance of the DHWRS. A regression analysis was carried out on the load/strain data. Equations relating applied load to measured strain are presented for several locations, including the critical position on the aft ring. Stress levels for a load of 24050N were calculated from the load/strain data. GRA

N85-25254# Naval Postgraduate School, Monterey, Calif.
PRELIMINARY HELICOPTER DESIGN DECISION MAKING BASED ON FLIGHT PERFORMANCE FACTORS M.S. Thesis
P. V. Adamcik Sep. 1984 98 p
(AD-A151488) Avail: NTIS HC A05/MF A01 CSCL 06/3

This thesis assists those evaluating helicopter design to make preliminary judgements about the feasibility of new designs. By using the computer program developed in this thesis, a designer can produce estimates for power requirements, endurance velocity, rate of climb, range velocity, hover ceiling, and service ceiling versus main rotor radius. These estimates can also be examined for the effects of changes in main rotor radius, chord, and rotational velocity. GRA

N85-25255# Institute for Defense Analyses, Alexandria, Va.
COST-ESTIMATING RELATIONSHIPS FOR TACTICAL COMBAT AIRCRAFT Memorandum Report, Oct. 1983 - Sep. 1984
J. W. Stahl, J. A. Arena, and M. I. Knapp Nov. 1984 44 p
(Contract MDA903-84-C-0031)
(AD-A151575; AD-E500700; IDA-M-14; IDA/HQ-84-28793) Avail: NTIS HC A03/MF A01 CSCL 01/3

This document presents four separate cost-estimating relationships (CERs): one each for RDT&E and procurement for helicopters and fixed-wing aircraft used in tactical air missions. The CERs are functions of such major characteristics as weight, thrust/weight ratio, speed and year of IOC. GRA

N85-25256# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MINIMUM TIME TURNS USING VECTORED THRUST M.S. Thesis
G. L. Schneider Dec. 1984 212 p
(AD-A151693; AFIT/GAE/AA/84D-24) Avail: NTIS HC A10/MF A01 CSCL 01/2

The objective of this thesis is to determine the optimal controls and trajectories which minimize the time to turn for a high performance aircraft with thrust vectoring capability. All determinations are subject to practical physical constraints. The determined controls and trajectories are then compared against other methods of turning in minimum time to conclude the effects and advantages of thrust vectoring. The results indicate that the use of vectored thrust can substantially reduce turning times and increase in-flight maneuverability. The greater the velocity at which the turn is initiated, the more the range of thrust vectoring capability is used and the greater the reduction in turning time. GRA

N85-25257# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
HIGH SPECIFIC POWER AIRCRAFT TURN MANEUVERS: TRADEOFF OF TIME-TO-TURN VERSUS CHANGE IN SPECIFIC ENERGY M.S. Thesis
S. B. Dron Sep. 1984 94 p
(AD-A151701; AFIT/GAE/AA/78D-5) Avail: NTIS HC A05/MF A01 CSCL 01/2

This thesis deals with the tradeoff between time-to-turn and the change in specific energy during a turn of 180 deg, for an aircraft of high specific power. This type of aircraft possesses the capability to sustain flight at the corner velocity where both maximum lift coefficient and maximum load factor occur simultaneously. However, the classical necessary conditions breakdown on this corner velocity arc and an additional constraint must be defined to determine the optimal control histories. The report first defines the necessary conditions for a generic optimal control formulation and then applies the formulation to this high specific power aircraft problem. The result is a three-point boundary value problem with a discontinuous interior corner condition at the beginning of the sustained corner velocity arc. All state and costate derivative and end conditions are presented with numerical methods for determining both minimum time and maximum energy gradient solutions. Anticipated results are provided for the formulations beginning at initial conditions both above and below the corner velocity. Results are presented for the minimum time solution only. Recommendations for further work in this same area are also provided. GRA

N85-25258# Naval Postgraduate School, Monterey, Calif.
THE DEVELOPMENT OF A PERFORMANCE AND MISSION PLANNING PROGRAM FOR THE A-7E AIRCRAFT M.S. Thesis
R. D. Hill Sep. 1984 54 p
(AD-A151717) Avail: NTIS HC A04/MF A01 CSCL 09/2

In this thesis, drag and performance data from the A-7E Naval Air Training and Operating Procedures Standardization Manual (NATOPS) were reduced to a series of analytical expressions and implemented in a mission planning program. The program was designed to be compatible with desk-top calculators (64K memory) of the type used in aircraft carrier Strike Operations Centers and to be interactive, so that air wing and operations personnel may use it regularly for mission planning. All or part of 15 NATOPS performance charts were reduced using math modeling

techniques which included curve-fitting and cross-plotting coefficients. Program implementation was demonstrated on an IBM 3033 using a Waterloo BASIC Compiler, and the program was checked for accuracy and operational suitability by a sample group of Navy attack pilots. GRA

N85-25259# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MULTIVARIABLE CONTROL LAW DESIGN FOR THE X-29 AIRCRAFT M.S. Thesis
T. L. Courtheyn Dec. 1984 308 p
(AD-A151828; AFIT/GE/ENG/84D-21) Avail: NTIS HC A14/MF A01 CSCL 01/4

Flight control laws are designed for the X-29 forward swept wing demonstrator aircraft using a design technique based on multivariable control law theory developed professor Brian Porter. The computer-aided design program called MULTI is used to develop and refine the control laws. MULTI also simulates the complete closed-loop control system and generated appropriate time response plots for analysis. Aircraft dynamics for several points in the flight envelope are represented by linearized state space equations obtained from NASA Dryden, and agency responsible for the development and testing of the X-29. Decoupled longitudinal and lateral equations are used to design separate longitudinal and lateral controllers. Control laws are developed to stabilize the aircraft and perform longitudinal maneuvers (direct climb, vertical translation, and beta pointing) at three different flight conditions, with and without first order-actuator dynamics and computational time delay added to the simulation. The responses are compared. GRA

N85-25260# Sandia Labs., Albuquerque, N. Mex. Aerodynamics Simulation Div.
A USER'S MANUAL FOR AMEER FLIGHT PATH TRAJECTORY SIMULATION CODE
Eugene J. Meyer Dec. 1984 206 p refs Revised
(Contract DE-AC04-76DP-00789)
(DE85-006580; SAND-80-2056-Rev) Avail: NTIS HC A10/MF A01

A guide to the use of the AMEER (Aero-Mechanical Equations Evaluation Routines) flight path-trajectory simulation code is presented. The input data requirements, computed output data available, code control features, and code flow logic are described for a rigid-body six-degree-of-freedom or point mass simulation. DOE

N85-26595*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HARRIER
Sean Caffee *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 31-34 (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 01C

N85-26605*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
YAV-8B HARRIER
Daniel Ornelas *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 89-91 ref (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 01C

N85-26608*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ROTORCRAFT DIGITAL ADVANCED AVIONICS SYSTEM (RODAAS)
Brent Taira *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 105-108 (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 01C

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-25261*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE AND SURGE LIMITS OF A TF30-P-3 TURBOFAN ENGINE/AXISYMMETRIC MIXED-COMPRESSION INLET PROPULSION SYSTEM AT MACH 2.5
Joseph F. Wasserbauer, Harvey E. Neumann, and Robert J. Shaw May 1985 21 p refs
(NASA-TP-2461; E-2412; NAS 1.60:2461) Avail: NTIS HC A02/MF A01 CSCL 21E

Steady-state performance and inlet-engine compatibility were investigated with a low-bleed inlet. The inlet had minimum internal contraction, consistent with high total pressure recovery and low cowl drag. The inlet-engine combination displayed good performance with only about 2% of inlet performance bleed. The inlet-engine combination had 5.58 deg angle-of-attack capability with 6% bleed. Author

N85-25268# National Aeronautical Establishment, Ottawa (Ontario). High Speed Aerodynamics Lab.
DEVELOPMENT OF A TEMPERATURE MEASUREMENT SYSTEM WITH APPLICATION TO A JET IN A CROSS FLOW EXPERIMENT Final Report
Candace Wark and John F. Foss Apr. 1985 123 p refs
(Grant NAG3-245)
(NASA-CR-174896; NAS 1.26:174896; FSFL-R-85-002) Avail: NTIS HC A06/MF A01 CSCL 21E

A temperature measurement system, which allows the simultaneous sampling of up to 80 separate thermocouples, was developed. The minimum resolution for the system corresponds to + or - 0.16 C per least significant bit of the A/D converter. The time constant values lambda, for each of the 64 thermocouples, were determined experimentally at 7 mps. Software routines were used to correct the measured temperatures for the effect of lambda for each thermocouple. The temperature measurement system was utilized to study the thermal field of a heated jet discharging perpendicularly into a low and a high disturbance level cross stream for a given momentum flux ratio and for three overheated values. The peak instantaneous temperatures reveal that strong molecular diffusion was operative. Various measures of the thermal field, for the disturbed case, suggest that the jet column remains relatively compact while being buffeted by the ambient turbulence field and that its penetration, into the cross wind, is inhibited by the presence of the strong disturbance field. E.A.K.

N85-25263*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NUMERICAL CALCULATION OF SUBSONIC JETS IN CROSSFLOW WITH REDUCED NUMERICAL DIFFUSION
Russell W. Claus 1985 19 p refs Presented at the 21st Joint Propulsion Conf., Monterey, Calif., 8-10 Jul. 1985; sponsored by

AIAA, SAE and ASME
(NASA-TM-87003; E-2548; NAS 1.15:87003) Avail: NTIS HC A02/MF A01 CSCL 21E

A series of calculations are reported for two, subsonic jet in crossflow geometries. The parametric variation examined are the lateral spacing of a row of jets. The first series of calculations corresponds to a widely space jet geometry, S/D = 4, and the second series corresponds to closely spaced jets, S/D = 2. The calculations are done with alternate differencing schemes to illustrate the impact of numerical diffusion. The calculated jet trajectories agreed well with experimental data in the widely spaced jet geometry, but not in the closely spaced geometry. E.A.K.

N85-25264*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SMALL GAS TURBINE COMBUSTOR STUDY: FUEL INJECTOR PERFORMANCE IN A TRANSPIRATION-COOLED LINER
Stephen M. Riddlebaugh and Carl T. Norgren 1985 20 p refs Proposed for presentation at the 21st Joint Propulsion Conf., Monterey, Calif., 8-10 Jul. 1985; sponsoed by AIAA, SAE and ASME
(NASA-TM-86989; E-2533; NAS 1.15:86989) Avail: NTIS HC A02/MF A01 CSCL 21E

The effect of fuel injection technique on the performance of an advanced reverse flow combustor liner constructed of Lamilloy (a multilaminate transpiration type material) was determined. Performance and emission levels are documented over a range of simulated flight conditions using simplex pressure atomizing, spill return, and splash cone airblast injectors. A parametric evaluation of the effect of increased combustor loading with each of the fuel injector types is obtained. E.A.K.

N85-25265*# Arizona State Univ., Tempe. Dept. of Mechanical and Aerospace Engineering.
BEHAVIOR OF TURBULENT GAS JETS IN AN AXISYMMETRIC CONFINEMENT Final Report
Ronald M. C. So and Saad A. Ahmed Jan. 1985 95 p refs (Grant NAG3-260)
(NASA-CR-174829; NAS 1.26:174829; CR-R-84041) Avail: NTIS HC A05/MF A01 CSCL 20D

The understanding of the mixing of confined turbulent jets of different densities with air is of great importance to many industrial applications, such as gas turbine and Ramjet combustors. Although there have been numerous studies on the characteristics of free gas jets, little is known of the behavior of gas jets in a confinement. The jet, with a diameter of 8.73 mm, is aligned concentrically in a tube of 125 mm diameter, thus giving a confinement ratio of approximately 205. The arrangement forms part of the test section of an open-jet wind tunnel. Experiments are carried out with carbon dioxide, air and helium/air jets at different jet velocities. Mean velocity and turbulence measurements are made with a one-color, one-component laser Doppler velocimeter operating in the forward scatter mode. Measurements show that the jets are highly dissipative. Consequently, equilibrium jet characteristics similar to those found in free air jets are observed in the first two diameters downstream of the jet. These results are independent of the fluid densities and velocities. Decay of the jet, on the other hand, is a function of both the jet fluid density and momentum. In all the cases studied, the jet is found to be completely dissipated in approximately 30 jet diameters, thus giving rise to a uniform flow with a very high but constant turbulence field across the confinement. Author

N85-25266*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTS IN DILUTION JET MIXING EFFECTS OF MULTIPLE ROWS AND NON-CIRCULAR ORIFICES
J. D. Holdeman, R. Srinivasan (Garrett Turbine Engine Co.), E. B. Coleman (Garrett Turbine Engine Co.), G. D. Meyers (Garrett Turbine Engine Co.), and C. D. White (Garrett Turbine Engine Co.) 1985 16 p refs Presented at the 21st Joint Propulsion Conf., Monterey, Calif., 8-10 Jul. 1985; sponsored by AIAA, SAE and ASME
(NASA-TM-86996; E-2542; NAS 1.15:86996) Avail: NTIS HC A02/MF A01 CSCL 21E

Experimental and empirical model results are presented that extend previous studies of the mixing of single-sided and opposed rows of jets in a confined duct flow to include effects of non-circular orifices and double rows of jets. Analysis of the mean temperature data obtained in this investigation showed that the effects of orifice shape and double rows are significant only in the region close to the injection plane, provided that the orifices are symmetric with respect to the main flow direction. The penetration and mixing of jets from 45-degree slanted slots is slightly less than that from equivalent-area symmetric orifices. The penetration from 2-dimensional slots is similar to that from equivalent-area closely-spaced rows of holes, but the mixing is slower for the 2-D slots. Calculated mean temperature profiles downstream of jets from non-circular and double rows of orifices, made using an extension developed for a previous empirical model, are shown to be in good agreement with the measured distributions. Author

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N85-25267*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECTS OF SIDE-STICK CONTROLLERS ON ROTORCRAFT HANDLING QUALITIES FOR TERRAIN FLIGHT
Edwin W. Aiken Apr. 1985 14 p refs Prepared in cooperation with Army Research and Technology Labs.
(NASA-TM-86688; A-85141; NAS 1.15:86688; USAAVSCOMTM-85-A-1) Avail: NTIS HC A02/MF A01 CSCL 01C

Pertinent fixed and rotary-wing feasibility studies and handling-qualities research programs are reviewed and the effects of certain controller characteristics on handling qualities for specific rotorcraft flight tasks are summarized. The effects of the controller force-deflection relationship and the number of controlled axes that are integrated in a single controller are examined. Simulation studies were conducted which provide a significant part of the available handling qualities data. The studies demonstrate the feasibility of using a single, properly designed, limited-displacement, multiaxis controller for certain relatively routine flight tasks in a two-crew rotorcraft with nominal levels of stability and control augmentation with a high degree of reliability are incorporated, separated three or two-axis controller configurations are required for acceptable handling qualities. E.A.K.

N85-25268# National Aeronautical Establishment, Ottawa (Ontario). High Speed Aerodynamics Lab.
A STUDY OF TRANSONIC FLUTTER OF A TWO-DIMENSIONAL AIRFOIL USING THE U-g AND p-k METHODS
B. H. K. Lee Nov. 1984 70 p
(AD-A151463; NAE-LR-615; NRC-23959) Avail: NTIS HC A04/MF A01 CSCL 20/4

Transonic flutter of a NACA64A006 airfoil undergoing plunging and pitching oscillations is studied using the U-g and p-k methods. The aerodynamic coefficients are calculated using an improved version of an ONERA unsteady transonic aerodynamics code which include the second time derivative term of the velocity potential in the governing equation. Comparisons with LTRAN2-NLR show good agreement up to and in some cases exceeding kc = 0.4, except for the pitching moment curves at the transonic dip Mach number of 0.85. All flutter results are presented for M = 0.85. The p-k method gives flutter speeds identical to those from the U-g method. Subcritical damping ratios using the U-g method with Frueh's and Miller's damping formula are quite close to those obtained from the p-k method, especially for large values of the airfoil-air mass ratio. Response of the airfoil to externally applied

forces and moments is studied using the p-k method and a viscous damping model for coupled motions. GRA

N85-25269# Aeronautical Research Labs., Melbourne (Australia).
THE DESIGN AND OPERATION OF A SIMPLE LOW-SPEED FLUTTER-SUPPRESSION MODEL
A. Goldman Apr. 1984 32 p
(AD-A151610; ARL-STRUC-TM-377) Avail: NTIS HC A03/MF A01 CSCL 20/4

This Australian report discusses a dynamic model which has been developed for use in a small low-speed wind tunnel. A feedback system has been used to drive a control surface in order to suppress flutter. Details of the model and results of preliminary tests are presented. GRA

N85-25270# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ACTIVE CONTROL OF FORWARD SWEPT WINGS WITH DIVERGENCE AND FLUTTER AEROELASTIC INSTABILITIES Ph.D. Thesis
K. E. Griffin 1 May 1984 164 p Document previously announced as N85-18063
(AD-A151837; AFIT/DS/AA-84-1) Avail: NTIS HC A08/MF A01 CSCL 01/3

Active feedback control is applied to cantilever forward-swept wings (FSW) providing significant increases in the critical airspeeds of aeroelastic flutter and divergence. Feedback compensation improves the critical airspeed for a divergence critical FSW by 25% and improves the critical airspeed for a flutter critical FSW example by 30%. These improvements are limited by the emergence as most critical, instabilities that were only secondary without feedback. The method of analysis is linear control theory in the Laplace domain. A significant improvement is made in the Pade Approximant method for calculating damped unsteady aerodynamic forces in the Laplace domain. GRA

N85-25271# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MULTIVARIABLE CONTROL LAW DESIGN FOR THE AFTI/F-16 WITH A FAILED CONTROL SURFACE M.S. Thesis
R. A. Eslinger Dec. 1984 350 p
(AD-A151908; AFIT/GE/ENG/84D-28) Avail: NTIS HC A15/MF A01 CSCL 01/2

Two linearized models containing coupled aircraft equations are developed for the AFTI/F-16. The first is a model of the healthy aircraft with all control surface intact, and the second is a model of the aircraft with a free-floating right horizontal tail and all other surfaces operational. The multivariable design technique of Professor Brian Porter and the computer program MULTI are first used to design control laws for the healthy model. The control laws are tailored to perform seven maneuvers at four flight conditions. Maximum maneuvers are commanded to yield maximum control surface deflections. The same control law designs are then applied to the model with a failed right horizontal tail, and the performance is evaluated. Some maneuvers require modifications to the designs or lowered maximum maneuver requirements to avoid overshooting the deflection limits of the operational control surfaces. Simulation responses are presented for both the healthy and failure aircraft models. Generally, when the right horizontal tail fails, the left horizontal tail assumes primary pitch control and the flaperons take over complete roll control. The flaperons, rudder, and canards deflect to counter the rolling and yawing moments produced by the left horizontal tail deflection. GRA

N85-25272# Air Force Armament Lab., Eglin AFB, Fla.
MULTI-RATE DIGITAL AUTOPILOT MODELING METHODOLOGY Final Technical Report, Jan. 1981 - Aug. 1983
D. G. J. Didaleusky Mar. 1985 100 p
(AF Proj. 2437)
(AD-A152044; AD-E801104; AD-TR-83-64; AFATL-TR-83-67) Avail: NTIS HC A05/MF A01 CSCL 01/3

This technical report presents the Multi-Rate Digital Autopilot Modeling Methodology used in the analysis of guided weapon system development programs within the Armament Division. This methodology evolved from many and varied autopilot analyses and has been refined as indicated in this report. Typical guided weapon programs that have used this approach are: Advance Medium Range Air-to-Air Missile (AMRAAM), WASP Antiarmor Missile, and Low Level Laser Guided Bomb (LLLGB). Reviews of both fundamental Z-Transform Theory and the Multi-Rate Transform are given. An example of a two-loop-per-channel autopilot typical of a symmetric missile is given. This autopilot is then modeled using Multi-Rate Transform theory to develop both open-loop and closed-loop transfer functions in the Z-plane. The computational algorithms used for Multi-Rate Modeling are referenced. GRA

N85-25182# National Aerospace Lab., Amsterdam (Netherlands).
APPLICATION OF TIME-LINEARIZED METHODS TO OSCILLATING WINGS IN TRANSONIC FLOW AND FLUTTER
H. H. L. Hounjet and J. J. Meijer *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 16 p refs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

N85-25186# Messerschmitt-Boelkow-Blohm G.m.b.H., Bremen (West Germany).
THE APPLICATION OF TRANSONIC UNSTEADY METHODS FOR CALCULATION OF FLUTTER AIRLOADS
Helmut Zimmermann *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 21 p refs (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N85-25273# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
WIND TUNNEL WALL INTERFERENCE Final Report, 1 Apr. 1982 - 31 Mar. 1983
D. B. Bliss and P. J. Lu Apr. 1984 95 p
(Grant AF-AFOSR-0158-82)
(AD-A151212; AFOSR-85-0167TR) Avail: NTIS HC A05/MF A01 CSCL 20/4

Behavior of isolated holes and slots in wind tunnel walls was studied. The aerodynamic characteristics of these individual wall elements can be used to help understand the behavior of walls with multiple perforations. Potential flow analysis similar to that employed in the kernel function approach to lifting surface theory was used to determine the pressure differential versus flowrate relationship for various hole planforms in high speed subsonic flow. The effect of an imposed pressure gradient was also analyzed. Good agreement with slender-body theory results was obtained for low aspect ratio planforms. Although the finite hole problem resembles the lifting wing problem, there are significant differences: the pressure differential is known and the free surface shape is unknown; the Kutta condition is applied to the hole leading edge; and there are no wake effects in the hole out-flow problem. The analysis was extended to include the effect of an inviscid rotational power law boundary layer over the hole by using a shear flow aerodynamics kernel function. The effect of the boundary layer was determined for transverse slots and holes with various planform shapes. Presence of a wall boundary layer tends to reduce the flow resistance coefficient and, since the layer thickness may be comparable to the hole size, the effect is reasonably strong. GRA

N85-25274# Naval Surface Weapons Center, White Oak, Md.
MACH-10 HIGH REYNOLDS NUMBER DEVELOPMENT IN THE NSWC (NAVAL SURFACE WEAPONS CENTER) HYPERVELOCITY FACILITY Final Report
R. A. Kavetsky 13 Feb. 1984 327 p
(AD-A151241; NSWC/TR-83-526) Avail: NTIS HC A15/MF A01 CSCL 14/2

The present NSWC hypervelocity facility has two Mach number capabilities (10 and 14) which operate over a range of Reynolds numbers. The Mach-10 leg had a maximum Reynolds number capability of 5.4 x 10 to the 6th power/ft. The Reynolds number region of interest for Mach-10, encompassing the reentry flight regime, has been established as 0 to 100 x 10 to the 6th power. Using oversized models in the present 5-foot diameter test cell, this Reynold's number regime scales down to a 0 to 20 x 10 to the 6th power/ft. The potential for a new, marketable testing capability, and the need to maintain a state-of-the-art facility, justified a major design effort to remove the constraints limiting the facility to the 5.4 x 10 to the 6th power/ft Reynolds number. This report documents this design effort, and subsequent performance of the new configuration. GRA

N85-25275# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
MATHEMATICAL MODELING OF THE AEDC (ARNOLD ENGINEERING DEVELOPMENT CENTER) PROPULSION WIND TUNNEL (16T) Final Report, 1 Oct. 1978 - 30 Sep. 1982
P. B. Stich Mar. 1985 109 p
(AF Proj. D216)
(AD-A151293; AEDC-TR-84-32) Avail: NTIS HC A06/MF A01 CSCL 14/2

An empirically based model of the 16-ft transonic Wind Tunnel (16T) in the Propulsion Wind Tunnel Facility at the Arnold Engineering Development Center, has been developed for calculating the distribution of tunnel component pressure losses and the effect of changes in these pressure losses on the tunnel total-power requirements. The model consists of two separate computer programs. The Historical Program assesses tunnel performance from a historical data base which was acquired during prior tunnel operation. The Analytical Model uses component pressure-loss information calculated by the Historical Program to evaluate potential changes in tunnel component pressure losses with respect to the tunnel power. The model was used to assess the potential power savings for a modification to the Tunnel 16T diffuser which involves the replacement of the compressor protective screen. Results indicate that for each 1-percent increase in diffuser recovery, a 4-percent decrease in main drive power will result. Less significant power savings were found for improvements to the other tunnel components. Author (GRA)

N85-25276# European Space Agency, Paris (France)
THE ONERA ESTABLISHMENT AT CANNES IN THE SERVICE OF AERONAUTICAL RESEARCH
Amede Bevert Nov. 1984 204 p refs Transl. into ENGLISH of "l'Etablissement ONERA de Cannes au Service de la Recherche Aeronautique" ONERA-P-1983-2 ONERA, Paris, 1983 Original language document was announced as ESA-92613
(ESA-TT-875; ONERA-P-1983-2) Avail: NTIS HC A10/MF A01

Research programs and test facilities of the French National Aerospace Research Office (ONERA) at Cannes are described. Wind tunnel apparatus, including balances, was developed. Research includes wind tunnel tests on highly sweptback wings; high lift; ground effect; vertical takeoff and landing; supersonic transport aircraft; and aerodynamic study of active control. Author (ESA)

N85-25583# Joint Publications Research Service, Arlington, Va.
SYSTEM OF LIGHT PROTECTION OF ANTENNA-MAST STRUCTURES OF RADIO-RELAY LINES Abstract Only
V. Ye. Larin, YE. V. Martynov, and M. P. Tischenko *In its* USSR Rept.: Electron and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 15-16 refs Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 8, Aug. 1984 p 14-15 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25190# Joint Publications Research Service, Arlington, Va.
ROUNDTABLE ON EFFECTIVE USE OF FLIGHT SIMULATORS
S. Sokolov, B. Orlov, and I. Kazanskiy *In its* USSR Rept.: Transportation (JPRS-UTR-85-008) 3 May 1985 p 12-19 Transl. into ENGLISH from Grazhdanskaya Aviatsiya (Moscow), no. 1, Jan. 1985 p 12-15 (For primary document see N85-25189 15-01)
Avail: NTIS HC A05

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N85-25277* National Aeronautics and Space Administration, Washington, D. C.
TECHNOLOGY FOR LARGE SPACE SYSTEMS: A BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 11
Jan. 1985 142 p
(NASA-SP-7046(11); NAS 1.21:7046(11)) Avail: NTIS HC $14.50 CSCL 22A

This bibliography contains 539 abstracts of reports, articles and other documents introduced into the NASA scientific and technical information system between January 1, 1984 and December 31, 1984. Abstracts are arranged in the following categories: systems; analysis and design techniques; structural concepts; structural and thermal analysis; structural dynamics and control; electronics; advanced materials; assembly concepts; propulsion; and miscellaneous. Subject, personal author, corporate source, contract number, report number, and accession number indexes are listed. M.G.

N85-25278* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GET AWAY SPECIAL (GAS) THERMAL DESIGN SUMMARY
Dan Butler Jul. 1983 63 p
(X-732-83-8) Avail: Issuing Activity CSCL 22A

The history of the get away special (GAS) thermal design and testing is reviewed. Results of the STS-3 Flight Verification Payload (FVP) are presented and compared to preflight predictions. Future concerns are addressed, including the thermal designs of the GAS motorized door assembly (MDA) and the GAS bridge system (GBS). E.A.K.

N85-25279*# Boeing Aerospace Co., Seattle, Wash.
SPACE STATION SYSTEMS TECHNOLOGY STUDY (ADD-ON TASK). VOLUME 2: TRADE STUDY AND TECHNOLOGY SELECTION Final Technical Report
Feb. 1985 181 p refs
(Contract NAS8-34893)
(NASA-CR-171416; NAS 1.26:171416; D483-10012-2) Avail: NTIS HC A09/MF A01 CSCL 22A

The current Space Station Systems Technology Study add on task was an outgrowth of the Advanced Platform Systems Technology Study (APSTS) that was completed in April 1983 and the subsequent Space Station System Technology Study completed in April 1984. The first APSTS proceeded from the identification of 106 technology topics to the selection of five for detailed trade studies. During the advanced platform study, the technical issues and options were evaluated through detailed trade processes, individual consideration was given to costs and benefits for the technologies identified for advancement, and advancement plans were developed. An approach similar to that was used in the subsequent study, with emphasis on system definition in four specific technology areas to facilitate a more in depth analysis of technology issues. G.L.C.

N85-25280*# Boeing Aerospace Co., Seattle, Wash.
SPACE STATION SYSTEMS TECHNOLOGY STUDY (ADD-ON TASK). VOLUME 3: TECHNOLOGY ADVANCEMENT PROGRAM

PLAN Final Report
Feb. 1985 61 p
(Contract NAS8-34893)
(NASA-CR-171417; NAS 1.26:171417; D483-10012-3) Avail: NTIS HC A04/MF A01 CSCL 22A

Program plans are given for an integrating controller for space station autonomy as well as for controls and displays. The technical approach, facility requirements and candidate facilities, development schedules, and resource requirements estimates are given.
A.R.H.

N85-25281*# Boeing Aerospace Co., Seattle, Wash.
DEFINITION OF TECHNOLOGY DEVELOPMENT MISSIONS FOR EARLY SPACE STATIONS: LARGE SPACE STRUCTURES Final Report
Richard M. Gates and George Reid 30 Nov. 1984 250 p
(Contract NAS8-35043)
(NASA-CR-171446; NAS 1.26:171446; D180-27677-2) Avail: NTIS HC A11/MF A01 CSCL 22A

The objectives studied are the definition of the tested role of an early Space Station for the construction of large space structures. This is accomplished by defining the LSS technology development missions (TDMs) identified in phase 1. Design and operations trade studies are used to identify the best structural concepts and procedures for each TDMs. Details of the TDM designs are then developed along with their operational requirements. Space Station resources required for each mission, both human and physical, are identified. The costs and development schedules for the TDMs provide an indication of the programs needed to develop these missions.
Author

N85-25282*# National Aeronautics and Space Administration, Washington, D. C.
MICROGRAVITY SCIENCE AND APPLICATIONS PROGRAM TASKS
Elizabeth Pentecost, comp. (Universities Space Research Assoc., Washington) Apr. 1985 222 p refs
(NASA-TM-87568; NAS 1.15:87568) Avail: NTIS HC A10/MF A01 CSCL 22A

The active research tasks of the microgravity science and applications program are reported. The purpose is to provide an overview of the program scope for managers and scientists in industry, university, and government communities. The report includes an introductory description of the program, strategy and overall goal; identification of the organizational structures and people involved; and a description of each research task, together with a list of recent publications. The tasks are grouped into six categories: (1) electronic materials; (2) solidification of metals, alloys, and composities; (3) fluid dynamics and transports, (4) biotechnology; (5) glasses and ceramics; and (6) combustion.
E.A.K.

N85-25283# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A DECISION SUPPORT METHODOLOGY FOR SPACE TECHNOLOGY ADVOCACY M.S. Thesis
P. H. Rensema and R. W. Chapman Dec. 1984 393 p
(AD-A151895; AFIT/GSO/OS/84D-3) Avail: NTIS HC A17/MF A01 CSCL 05/1

In this thesis a decision support methodology for space technology advocacy was developed. Decision models inadequately address the risk and uncertainty inherent in R&D. A decision support methodology was developed that would assist the Air Force space technology advocate to determine the strategic and technical utility of space technology issues. Model criteria were developed that could be used in a worth assessment of space technology issues. Using these criteria the decision maker can focus on the strategic appreciation of the technology issues and their relative worth to military space strategy and doctrine and military space technology. A description was presented of the information requirements and the analytical tool (the Analytic Hierarchy Process) which could be used by the decision maker, with the appropriate user interface, to apply the criteria in a worth assessment of space technology issues. The results of testing the validity, adequacy, and suitability of the proposed methodology are presented. The criteria was applied to sets of space technology issues within the context of the Analytical Hierarchy process. Results indicate that the proposed methodology provides a firm foundation for development of a microcomputer-based decision support system. Included is an extensive bibliography of mathematical models pertaining to R&D project selection.
GRA

N85-25284# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE
4 Mar. 1985 157 p refs Transl. into ENGLISH from various Russian articles
(JPRS-USP-85-003) Avail: NTIS HC A08/MF A01

Various topics in aerospace engineering and the natural space sciences are addressed. Subject areas include solar physics, space radiation, planetology, orbital mechanics, exobiology, general aerospace engineering, space applications, and space policy. For individual titles, see N85-25285 through N85-25361.

N85-25285# Joint Publications Research Service, Arlington, Va.
HOLOGRAPHY IN SPACE Abstract Only **c35**
V. M. Tuchkevich, Y. P. Semenov, and S. B. Gurevich *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 1-11 Transl. into ENGLISH from Zemly i Vselennaya (USSR), no. 3, May-Jun. 1984 p 17-24 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The principles and merits of holographic methods are reviewed and the utilization of holography in experiments conducted onboard the Salyut 6 and 7 space stations is discussed. A short history of the development of the spaceborne holographic apparatus is given. The objects of the experiments included the dissolution of NaCl under weightless conditions; observation of station window microdefects; analysis of electrophoresis processes; and studies directed towards determining the quality of holographic results.
M.G.

N85-25286# Joint Publications Research Service, Arlington, Va.
ANGULAR ERROR OF POSITION OF RATAN-600 SCREENS DURING RADIAL DISPLACEMENT Abstract Only **c89**
Y. K. Zverev *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 13 Transl. into ENGLISH from Geod. i Kartograf. (USSR), no. 8, Aug. 1984 p 17-21 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The accuracy of the main mirror of the RATAN-600 radiotelescope is determined primarily by the accuracy of manufacture of the surface of the reflecting elements and their placement in their calculated positions in radius, azimuth, elevation angle and altitude. Study of the azimuth and elevation angle errors arising upon radial displacement of the screen was a necessary element in combined studies of the radiotelescope performed in order to increase its effectiveness. The studies were performed using 23 screens from the central group of the north sector of the circular reflector. Measurements were performed by an autocollimation theodolite using 80 mm diameter mirror in six fixed positions on two different occasions. Each session included measurements with the screens moving forward and back. The major results indicate that in spite of measurable errors in manufacture and installation of the rails of the supporting beam and carriage rollers, their influence on accuracy of the surface of the circular reflector of the radiotelescope can be reduced to the necessary level. Proper consideration of azimuthal errors is effective for wavelengths of over 4 mm.
Author

N85-25287# Joint Publications Research Service, Arlington, Va.
ELEMENTARY SUNSPOT ENERGY MODEL Abstract Only **c92**
A. A. Solovyev *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 13-14 Transl. into ENGLISH from Astronomicherskiy Zh. (USSR), v. 61. no. 4, Jul.-Aug. 1984 p 764-770 (For primary document see N85-25284 15-12)

Avail: NTIS HC A08/MF A01

An effort is made to explain the fact that the strength of the magnetic fields observed in spots varies in a quite narrow range (1000 to 4000 Oe). In addition, since a sunspot is a quite isolated and stationary formation, an effort is made to ascertain whether the spot as a whole has characteristic oscillations, and if so, what might be the period. The study is based on an analysis of the total energetics of the spot, but with emphasis on change in the gravitational energy of the plasma as a function of the depth of immersion of the spot into the photosphere. These problems are examined using a simple model of a sunspot in the form of a vertical magnetic cylinder plunged into the photosphere. Calculations reveal that the main contribution to spot energy is from change in the magnetic and gravitational energy of the system. The model made it possible to find the stable equilibrium state of a sunspot for a given magnetic flux. The equilibrium value of magnetic field strength in a spot was determined as a function of its depth (lower boundary) and some characteristics of the medium surrounding the spot. Finally, the effective depth of the spot was estimated. The period of the small free oscillations of the spot is T approx. = 5 sup m. Author

N85-25288# Joint Publications Research Service, Arlington, Va.
MODELING 22-YEAR SOLAR ACTIVITY CYCLE WITHIN FRAMEWORK OF DYNAMO THEORY WITH ALLOWANCE FOR PRIMARY FIELD Abstract Only **c92**
M. I. Pudovkin and Y. Y. Benevolenskaya *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 14-15 Transl. into ENGLISH from Astronomicheskiy Zh. (USSR), v. 61, no. 4, Jul.-Aug. 1984 p 783-788 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The R. B. Leighton model was used in a description of evolution of the magnetic field on the Sun in the convective zone and at its surface. It was found that the maximum intensity which the background magnetic fields attain 2 years prior to the cycle maximum is 2.6 to 2.7 gauss in an epoch of an even cycle and 3.6 to 3.7 gauss in an epoch of an odd cycle at latitudes of about 10 to 20 deg N, S. The intensity of the polar fields averages 0.5 gauss, as is actually observed. A change in polarity of the polar fields occurs during the period of the solar activity maximum. Polar fields are formed by magnetic fields drifting from the middle latitudes. The middle-latitude fields have the polarity of the leading spots in the particular cycle and in each of the hemispheres. During the dropoff of the cycle the middle-latitude and equatorial fields have opposite polarity relative to the high-latitude fields. In the period of the minimum the magnetic fields in each of the hemispheres have an identical polarity. In the phase of growth of an odd cycle the middle- and high-latitude fields reverse their polarity. These and other findings reveal that the Leighton model gives a quite realistic distribution of background magnetic fields during two successive 11-year cycles. Author

N85-25289# Joint Publications Research Service, Arlington, Va.
SPECTRAL ANALYSIS OF DIURNAL NONUNIFORMITY OF EARTH'S ROTATION Abstract Only **c43**
G. P. Pilnik *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 15 Transl. into ENGLISH from Astronomicheskiy Zh. (USSR), v. 61, no. 4, Jul.-Aug. 1984 p 806-811 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Virtually nothing is known concerning the nonuniformity of the Earth's rotation in the course of a 24-hour period. Astronomical time determinations for the period 1968 to 1978 revealed the existence of waves having a period of 24 hours or less which have difinitely been identified with nonuniformity of diurnal rotation. According to the law of conservation of moment of momentum C omega = const. However, if pairs of forces are formed due to a nonuniform distribution of densities in the Earth's interior and the instantaneous angular velocity omega changes, there should be a corresponding change in the moment of inertia. A thorough theoretical study of the possibility of such trembling is required. The diurnal rotation of the Earth is much more complex than suggested by modern celestial mechanics. Formulation of a more precise model requires reliable determinations of the amplitudes and phases of all harmonics of the intradiurnal nonuniformity of the Earth's rotation. It is recommended that such research be carried out within the framework of the international MERIT program. There is a need for accumulation of longer series of observations, but these must be broken down into parts and analyzed separately. Author

N85-25290# Joint Publications Research Service, Arlington, Va.
MAGNETIC FIELD PENETRATION INTO COMETARY IONOSPHERE Abstract Only **c46**
Z. M. Ioffe *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 15-16 Transl. into ENGLISH from Astronomicheskiy Zh. (USSR), v. 61, no. 4, Jul.-Aug. 1984 p 812-814 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Two articles by Marochnik and Ershkovich concerning the possibility of magnetic field penetration into a cometary ionosphere are critically examined and possible mechanism for the penetration process is suggested. The Kelvin-Helmholtz instability developing at the boundary of the ionosphere should lead to a breakdown of the continuous magnetic barrier into individual plaits having some degree of twisting. The field strength in the plait can increase to levels at which B squared/8 pi approx. = W(kin), where W(kin) is the density of the kinetic energy of the undisturbed solar wind. The magnetic plait, a region of an intensified field, whose ends remain frozen into the solar wind, will be drawn into the coma plasma under the influence of magnetic attraction. Charged particles are reflected from the region of the stronger field, experiencing a sort of collision with it. The rate of penetration can be calculated by regarding a plait element as a heavy molecule. Estimates are given for all the pertinent parameters, from which it is found that the velocity of field motion can attain 10 to the 5th power cm/sec. Author

N85-25291# Joint Publications Research Service, Arlington, Va.
OBSERVATION OF POLAR AURORA FROM THE SALYUT-6 SPACE STATION DURING THE GREAT GEOMAGNETIC STORM OF 11-13 APR. 1981 Abstract Only **c46**
A. I. Lazarev, V. V. Kovalenok, and L. S. Yevlashin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 16 Transl. into ENGLISH from Geomagnetizm i Aeronomiya (USSR), v. 24, no. 4, Jul.-Aug. 1984 p 620-624 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The results of visual observation of auroras in the Southern Hemisphere performed by the cosmonauts of the 5th major expedition onboard the Salyut-6 space station, flying at about 350 km altitude are presented. Notes made by the cosmonauts are quoted verbatim. The observations on the 11th and 12th of April, 1981 were used to construct schematic maps showing the area of the auroras above the Southern Hemisphere. The observations allow clear determination of the geographic area and date and time of the aurora associated with the magnetic storm. Author

N85-25292# Joint Publications Research Service, Arlington, Va.
PULSATIONS OF COSMIC RAY INTENSITIES BEFORE INCREASING FLUX OF RELATIVISTIC PARTICLES FROM SOLAR FLARES Abstract Only **c93**
S. A. Starodubtsev and A. T. Fillippov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 17 Transl. into ENGLISH from Geomagnetizm i Aeronomiya (USSR), v. 24, no. 4, Jul.-Aug. 1984 p 682-683 Original language document announced as A84-47527 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

A previous work showed that 24 hours before an increase in the flux of relativistic particles from solar flares, pulsations are observed in cosmic rays with periods of 30 to 40, 60 to 90 and less frequently 120 to 160 minutes. Cosmic ray data several hours before the increase in flux of relativistic particles on the Earth generated during solar flares was investigated. Five minute data from stations of the world network were analyzed for several vents.

The results show that pulsations before solar flares cannot be caused by the influence of the atmosphere or magnetosphere on the intensity of cosmic rays. This indicates that the pulsations in cosmic rays before solar flares are of interplanetary or solar origin. Author

N85-25293# Joint Publications Research Service, Arlington, Va.
CYCLIC CHANGES IN BAROMETRIC COEFFICIENT OF COSMIC RAY NEUTRON COMPONENT Abstract Only c93
O. G. Rogava and L. K. Shatashvili *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 17-18 Transl. into ENGLISH from Geofiz. Zh. (USSR), v. 6, no. 5, Sep.-Oct. 1984 p 73-75 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The availability of more precise instrumentation and the accumulation of longer series of observational data have made possible a reassessment of the nature of change in 11-year variations in the barometric coefficient of the cosmic ray neutron component and a more precise allowance for the corresponding corrections for the barometric effect in continuous cosmic ray data. A series of barometric coefficients were computed for Sanae station in Antarctica and Churchill station in Canada for the period 1957 to 1972. Convincing evidence was obtained of the existence of an 11-year cycle in changes of the barometric coefficient. The amplitude of the relative change beta/beta % of the 11-year cyclicity of the barometric coefficient beta was about 7 to 8%, corresponding to the 11-year solar activity cycle. There is some tendency to a 2-year cycle of variations of the barometric coefficient which for beta(N)-beta(S) is not manifested synchronously: when the oscillation attenuates at Sanae it appars at Churchill. A study made of the record for Sanae station, made separately for even and odd years, suggests the presence of both annual and 2-year changes in the barometric coefficients and also variations with a period close to the period of 3 to 4 solar rotations. Author

N85-25294# Joint Publications Research Service, Arlington, Va.
SOME NUMERICAL ESTIMATES OF PERTURBATION OF ORBITAL ELEMENTS OF ARTIFICIAL EARTH SATELLITE WITH TOTAL DYNAMIC SYMMETRY ABOUT ROTATING ASPHERICAL EARTH Abstract Only c13
D. Z. Koyenov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 18 Transl. into ENGLISH from Dokl. Akad. Nauk Tadzhikskoy SSR (USSR), v. 27, no. 6, Jun. 1984 p 314-317 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The problem of motion of a satellite with total dynamic symmetry about a rotating aspherical Earth was solved in an earlier study. With an accuracy to 10 to the -8th power it was possible to derive analytical formulas for perturbed Delaunay elements of a satellite orbit. It was demonstrated that the Delaunay elements characterizing the translational motion of a satellite about the Earth receive sensitive perturbations caused by the Earth's figure. The elements determining the Earth's rotational motion remain virtually constant. The formulas derived in the earlier study are used to find the numerical values of the perturbation of Delaunay elements for a specific artificial Earth satellite for a significant time period. The following case is examined: an artificial satellite of spherical configuration with perigee altitude 500 km, apogee altitude 1,000 km, longitude of ascending Omega = 45 deg, angular distance of perigee from node Omega = 30 deg, orbital inclination i = 57 deg, moment of transit through perigee tau = 0. Author

N85-25295# Joint Publications Research Service, Arlington, Va.
X-RAY EXPERIMENT ON PROGNOZ-9 ARTIFICIAL EARTH SATELLITE Abstract Only c15
M. I. Kudryavtsev and S. I. Svertilov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 19 Transl. into ENGLISH from Vestn. Moskovskogo Univ., Ser. 3: Fiz., Astron. (USSR), v. 25, no. 5, Sep.- Oct. 1984 p 81-86 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Instrumentation carried aboard the Prognoz-9 artificial Earth satellite made possible the simultaneous registry of X-radiation and charged particles of different types in a wide energy range. This provided data on background increases in the fluxes of X-radiation caused by increases in fluxes of charged particles and when necessary made it possible to exclude simulation of X-radiation events by charged particles. The satellite carried on RKh-1 scintillation spectrometer for measuring X-radiation fluxes in the ranges 10 to 50, 25 to 50, 50 to 100 and 100 to 200 keV. Two main operating regimes were employed: continuous and once per second. During the initial stage of the flight the RKh-1 was oriented on the region of the galactic anticenter. Its field of view intercepted several X-ray sources, including the source in Crab nebula. The principal sensing element of each sensor is a CsI(T1) crystal with a thickness of 2.5 mm and a diameter of 80 mm. During the first half of the flight year the RKh-1 registered several hundred bursts of solar X-radiation. Good results were also obtained in studying cosmic gamma bursts of nonsolar origin and X-ray pulsars. The response of the RKh-1 in registering X-ray bursts was evaluated. Author

N85-25296# Joint Publications Research Service, Arlington, Va.
USE OF ATMOSPHERIC MODELS IN PREDICTING ARTIFICIAL EARTH SATELLITE MOTION Abstract Only c46
O. A. Malkin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 20 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geodiziya i Aerofotosyemka (USSR), no. 3, May-Jun. 1984 p 44-49 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The atmospheric models, both static and dynamic, used in predicting motion of artificial Earth satellites (AES) described in the Soviet and American literature are critically examined. Emphasis is on dynamic models based on direct observations. These models can be used in determining parameters at a given point in circumterrestrial space. They are used in relatively precise theoretical determination of AES position and predicting the behavior of a satellite at given times or in given time intervals. It is possible to determine the future time at which a satellite will arrive at a specific point in space. This requires that the proper atmospheric model (of which there are many) be selected. An approach for comparing atmospheric models is suggested. A critique of work already done along these lines is presented.
Author

N85-25297# Joint Publications Research Service, Arlington, Va.
USING VELOCITY VECTOR IN DETERMINING KEPLERIAN ORBIT OF GEODECTIC SATELLITE Abstract Only c13
I. V. Onkov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 20-21 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geodeziya i Aerofotosyemka (USSR), no. 2, Mar.-Apr. 1984 p 49-55 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The problem of determining the Keplerian orbit of a satellite on the basis of the known values of its velocity vector at three moments in time is examined and two methods for its solution are presented. Solution of this problem can be used in preliminary determination of the orbit of a planetary satellite on the basis of measurements of radial velocity and directions from three stations whose coordinates are unknown. The satellite velocity vector is found by solution of a system of three linear equations. After formulating the problem a geometrical solution is obtained. A solution with the use of derivatives requiring solution of a system of four nonlinear equations with four unknowns is also presented. A series of expressions is derived which give a solution of the problem of determining satellite orbit from the velocity vector stipulated at three moments in time. Author

N85-25298# Joint Publications Research Service, Arlington, Va.
INVESTIGATING STATISTICAL CHARACTERISTICS OF ATMOSPHERIC BACKGROUND BRIGHTNESS AND STAR BACKGROUND DENSITY IN EQUATORIAL REGION OF CELESTIAL SPHERE Abstract Only c89
S. I. Vereshchagin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 21-22 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geodeziya Aerofitosyemka (USSR), no. 2, Mar.-Apr.

1984 p 56-60 Original language document announced as A84-40000 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The statistical characteristics of atmospheric background brightness and star background density were determined in the equatorial region of the celestial sphere. Such data can be used in stipulating requirements on planned artificial satellites and in programming observations of faint astronomical objects. The basis of the statistical research method is modeling of m(back) (atmospheric background brightness) or N (total number of stars) in each j-th circle of declination of the surveyed region and determination of the parameter K (the number points in the entire region at which the brightness of the atmospheric background or star background density assumes the i-th value from a series of stipulated values). It was found that the dynamics of changes in brightness m(back) as a function of lunar phase a virtually identical character during all seasons of the year with a variation delta m(back) < or = 0 sup m.7. This makes it possible to evaluate the need for using special methods and instrumentation for ensuring the required penetrability. B.W.

N85-25299# Joint Publications Research Service, Arlington, Va.
SYSTEMATIC AND RANDOM DEFORMATIONS OF ORBITS OF LONG-PERIOD COMETS Abstract Only **c91**
V. A. Antonov and Z. P. Todriya *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 22 Transl. into ENGLISH from Pisma v Astronomicheskiy Zh. (USSR), v. 10, no. 5, May 1984 p 394-396 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Cometary orbits can be classified on the basis of their semimajor axis a, each of which is characterized by a certain relationship between the solar gravitational force (SGF) and galactic perturbational forces (GPF). This article is limited to comets with a approx 10 to the 3rd power -10 to the 4th power AU. In such cases the role of GPF gradually increases and they must be taken into account as small perturbations. These GPF are of a dual nature. They include regular forces (RF), systematically operative, and irregular forces (IF) of a random nature. A system of differential equations for evolution of the orbital elements of a comet under the influence of the RF of the Galaxy on the assumption of a solar circular orbit were derived. The study was limited to a Hooke perturbing potential approximation. The equations were averaged for the period of revolution of the comet around the Sun. It was found that during half a galactic year the orbital elements change little as a result of perturbations. A system of averaged differential equations was derived for which a general solution was found. B.W.

N85-25300# Joint Publications Research Service, Arlington, Va.
ONE METHOD FOR CONSTRUCTING MODEL OF POINT MASSES OF PLANETARY GRAVITY FIELD Abstract Only **c46**
A. L. Tserklevich and S. D. Volzhanin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 23 Transl. into ENGLISH from Pisma v Astronomicheskiy Zh. (USSR), v. 10, no. 7, Jul. 1984 p 549-553 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Use of a multipoint form of representation of gravity potential has significant advantages in numerical integration of the differential equations of motion of a space vehicle near a planet. However, the traditional approach for determining the parameters of a model of point masses (MPM) is ineffective in constructing detailed and precise multipoint potential models. A model based on determination of the anomalous masses of spherical pyramids obtained by dividing the body of a planet and their replacement by point masses situated at different depths at the centers of the bases of the pyramids is proposed. The method makes it possible to determine the parameters of a sufficiently large number of point masses and obtain a solution close to the optimum with the required accuracy. The proposed method was tested by constructing a model of 288 point masses uniformly approximately the Earth's gravity field. The initial information used was 18 harmonic coefficients in the GEM 10 B geopotential model. The Earth was broken down into pyramids using a uniform 15 deg geographic grid. B.W.

N85-25301# Joint Publications Research Service, Arlington, Va.
MINIMAX PROBLEM OF ESTIMATING TRAJECTORY PARAMETERS IN CONTINUOUS FORMULATION Abstract Only **c13**
M. L. Lidov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 23-24 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 483-498 Original language document announced as A84-48001 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The problem of the linear estimation of trajectory parameters in a continuous formulation is considered in the case when the measurement errors contain two mutually noncorrelated components; (1) white noise, and (2) a random process with a known variance and an unknown correlation function. A formulation is given to the problem of determining the unbiased linear estimation algorithm from the condition of the minimization of the maximum according to the unknown correlation function of the variance of the derivation of the estimate from the true value of the estimated parameter. The example of the nearly circular motion of a satellite is considered. B.J. (IAA)

N85-25302# Joint Publications Research Service, Arlington, Va.
RESONANT ROTATIONS OF SATELLITE IN POLAR ORBIT IN MAGNETIC AND GRAVITATIONAL FIELDS Abstract Only **c13**
V. V. Beletskiy and A. N. Shlyakhtin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 24 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 499-506 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

A second order differential equation is written for the planar rotations of a satellite about a center of mass in an elliptical polar orbit subjected to both gravitational and magnetic forces with the true anomaly as the independent variable. It is assumed in the solution that the permanent magnetic moment is directed along the axis of the satellite corresponding to the moment of inertia, the axis forming an angle with the current radius vector. The Earth's magnetic field is a dipole field with the dipole axis coinciding with the Earth's axis of rotation. The main resonances of the orientation of the satellite in absolute space, the current radius vector of the orbit and the current magnetic line of force are analyzed to demonstrate the feasibility of strict and stable orientation of the satellite with respect to these three orientations. It is possible to completely compensate eccentric oscillations of the satellite by the magnetic field. The special case of a circular orbit is analyzed in considerable detail, showing the magnetic field ranges for which stable solutions exist. Author

N85-25303# Joint Publications Research Service, Arlington, Va.
MULTISTEP ORBITAL CORRECTION ALGORITHMS FOR AN EARTH SATELLITE USING LOW THRUST ENGINE Abstract Only **c13**
V. V. Vasilyev and V. V. Salmin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 25 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 507-519 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Low altitude Earth satellites are subjected to aerodynamic forces that can vary considerably in a short tiome, making precise prediction of orbital parameters difficult. It is possible to correct low elliptical orbits so as to compensate for these forces using low thrust engines such as ion reaction motors. The unpredictability of atmospheric density nonetheless necessitates the use of ongoing measurements of actual orbital parameters and the utilization of this data in a computer flight control system. Control algorithm are developed based on analytical and semianalytical models of the controlled motion, which allow the updating of the control parameters with each orbit. The proposed correction algorithms provided for the step-by-step compensation of the perturbing forces via direct measurements and the calculation of the controlling

data from approximate equations. The technique is illustrated with a comparative analysis of the approximate and precise determination of control parameters for the case when the orbital period and perigee are corrected, for the cases of both high and low solar activity levels, for an orbit having an apogee of 350 km and a perigee of 160 km. B.W.

N85-25304# Joint Publications Research Service, Arlington, Va.
CONSTRUCTION OF CONDITIONALLY PERIODIC SOLUTIONS OF PROBLEM OF RECIPROCATING MOTION OF AXIALLY SYMMETRIC SATELLITE OF TRIAXIAL PLANET Abstract Only **c90**
A. A. Zlenko *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 25-26 Transl. into ENGLISH from Kosmicheskiya Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 531-536 Original language document announced as A84-48005 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Attention is given to Zhuravlev's (1981, 1982) stationary solutions to an averaged system of equations of the first approximation, corresponding to conditionally periodic solutions in the first approximation for the unaveraged system of equations of motion. The generating function of the canonical transformation is derived, and conditionally periodic solutions are obtained for different systems of variables describing the translational-rotational motion of a satellite of a triaxial planet. B.J. (IAA)

N85-25305# Joint Publications Research Service, Arlington, Va.
PERTURBATIONS OF KALMAN FILTERING PROCESS Abstract Only **c64**
A. A. Chernov and V. D. Yastrebov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 26 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 537-542 Original language document announced as A84-48006 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Formulas are derived for calculating perturbations of the estimation of a state-vector estimate obtained on the basis of a Kalman discrete filtering algorithm. The following perturbation sources are considered: perturbations of the covariance matrix of measurement noise, the covariance matrix of filtering errors, the measurement matrix, and the transition matrix of the system; and perturbations of the state-vector estimate at the preceding step. The results obtained can be used to analyze the performance of spacecraft navigation systems. B.J. (IAA)

N85-25306# Joint Publications Research Service, Arlington, Va.
FAST ION POLARIZATION JET IN SUBAURORAL F-LAYER AND ITS MANIFESTATION IN STRUCTURE OF HIGH LATITUDE IONOSPHERE Abstract Only **c46**
V. M. Filippov, L. V. Shestakova, and Y. I. Galperin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 27 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 557-564 Original language document announced as A84-48008 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Satellite (e.g., Cosmos-184, OGO-6, and AE-C) measurements of convection and electric fields in the magnetosphere as well as Chatanika incoherent-scatter data indicate the presence of a narrow zone of very fast ion drift toward the west in the subauroral region during substorms. Variations in the electron density distribution in the lower F-region in the fast-drift zone are analyzed; a quantitative density model is obtained; and this model is used to calculate model ionograms, close to those observed at a subauroral ionospheric station situated near the fast drift zone. A comparison of theoretical and experimental ionograms makes it possible to identify cases of the appearance of a fast drift zone (a polarization jet) near a station, and to identify the distance to this zone according to the ionograms. B.J. (IAA)

N85-25307# Joint Publications Research Service, Arlington, Va.
ION KINETICS, SMALL NEUTRAL AND EXCITED COMPONENTS IN D-REGION WITH ELEVATED IONIZATION LEVEL. PART 2: VARIATIONS IN SMALL NEUTRAL AND EXCITED COMPONENTS Abstract Only **c46**
N. V. Smirnova, S. I. Kozlov, V. A. Vlaskov, and N. A. Ovchinnikov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 28 Transl. into ENGLISH from Kosmicheskiya Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 565-571 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

This paper analyzes the behavior of the following oxygen, hydrogen and nitrogen components at these ionization rates: O(3P), O(1D), O3, O2(1 delta g); H, OH, HO2, H2, H2O, H2O2; N(4S), N(2D), NO, NO2 and N2O. As the ionization level increases in the D layer, the influence of the ionized and small neutral components on each other also increases. The distributions of the overwhelming majority of small neutral and excited components are considerably disrupted. At 80 km under nighttime conditions, these concentrations increase (with the exception of O3) with a rise in the ionization rate. The influence of the season on the behavior of the oxygen components is manifest when the rate is 10 to the 7th power/cu cm/s. Concentrations of odd hydrogen components increase at altitudes below 80 km. The H and OH formation per electron-ion pair is governed by the altitude, ionization rate and the season. The concentrations of H2O practically do not change under the above conditions. The concentrations of atomic nitrogen and NO increase substantially with an elevated ionization level. The NO formation per electron-ion pair is not a constant, being a function of the time of day, ionization rate and altitude. B.W.

N85-25308# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL CHECK OF ION TRANSPORT MECHANISM IN EARTH'S RADIATION BELT WITH EXPOSURE TO NON-STEADY-STATE ELECTRIC FIELDS Abstract Only **c46**
M. I. Panasyuk *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 29 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 572-587 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

This paper tests the conclusions of magnetic and electric diffusion theories by comparing theory and experiment for the position of the maxima of the radial profiles of the intensities of L sub jm protons and heavy ions close to the geomagnetic equator. The analysis of the spatial distribution of these intensity maxima is based on H, He, C and O ions in an energy range of from 100 keV to about 70 MeV. Calculations of these maxima for the energetic ionic component of the belts assuming magnetic or electric diffusion show that the spectra of the magnetic and electric field fluctuations in the center of the belt must differ substantially. The calculations are in good agreement with experimental data if the geomagnetic fluctuation spectrum is an f(-2) function of frequency, while the electric field spectrum is flat. The measured spectra of the electric fields in this range of drift frequencies take the form of a monotonically declining function. The primary mechanism for the formation of ion radiation belts at energies above a few hundred keV at shell levels L = 2 to 3.5 is the transport occurring with fluctuations in the geomagnetic field. B.W.

N85-25309# Joint Publications Research Service, Arlington, Va.
ELECTRIC POTENTIAL OF SATELLITE IN ELECTRON EMITTING EXPERIMENTS IN INITIAL STAGE OF ELECTRON BEAM INJECTION IN STEADY-STATE MODE Abstract Only **c15**
V. A. Fedorov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 30 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 588-593 Original language document announced as A84-48011 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

A theoretical study is made of the initial stage of electron-beam injection in active experiments in the ionosphere in the steady-state mode, just prior to the ionization of the neutral particles. The electric potential of the electron-emitting satellite and the size of the space-charge region are related to the value of the injection current at this initial stage. A formula is derived

for the electric potential of the satellite in the steady-state model as a function of the initial conditions of the experiment. B.J. (IAA)

N85-25310# Joint Publications Research Service, Arlington, Va.
SPACE-TIME FEATURES OF SOLAR COSMIC RAY PENETRATION INTO HIGH LATITUDE REGIONS OF EARTH'S MAGNETOSPHERE BASED ON INTERCOSMOS-19 SATELLITE DATA Abstract Only **c92**
G. A. Glikhov, Y. P. Kratenko, Y. V. Mineyev, and Y. S. Spirkova *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 31 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 594-598 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The penetration of solar cosmic rays into the upper latitude magnetosphere increased during the strong magnetic storm of 3-5 April 1979 (the maximum D sub st variations was -197 nT at 01 UT on 4 April). The data were obtained from the Intercosmos-19 satellite at an altitude of about 500 km in the Northern Hemisphere in the afternoon and evening MLT sector and in the Southern Hemisphere at about 1,000 km in the morning to night sector. Solar cosmic ray proton penetration is studied along with the evolution of the high latitude electron capture boundary for various electron energies. During the storm: (1) the position of the penetration boundaries shifted toward the equator; (2) there was a variety of fluctuations in the location of the boundaries shifted toward the equator; (2) there was a variety of fluctuations in the location of the boundaries of the different penetration regions; and (3) rapid pulsations were observed for the penetrating particles on the day side of the magnetosphere close to the daytime polar cusp. The pulsation period of penetrating electrons of 15 to 20 sec correlates well with the fluctuations in the actual magnetic fluid.
B.W.

N85-25311# Joint Publications Research Service, Arlington, Va.
MAGNETOHYDRODYNAMICS OF EARTH'S BOW SHOCK Abstract Only **c46**
V. G. Yeselevich *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 31-32 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 599-608 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Magnetohydrodynamics (MHD) equations have been applied before to the analysis of the Earth's bow shock, with the distance of the shock wave from the center of the Earth and the magnetopause thickness being determined experimentally. The values of the exponent range from 1.2 to 2. This paper is an analysis of the accuracy of MHD calculations of the adiabatic exponent for the plasma behind the bow shock. MHD equations are solved for a plane shock wave discontinuity and the solutions are compared with experimental data from the GEOS-1 and ISEE-1 and 2 satellites for 1969 and 1977. Functions are given which considerably improve the precision of the determination of the effective adiabatic exponent of the plasma behind the shock wave front. For a quasiperpendicular bow shock and Alfyen Mach numbers of more than 2.5-3.0 (values of 5-6 are the most characteristic), plasma flow behind the front in the quasisteady-state is satisfactorily described by MHD equations with an adiabatic exponent of 5/3, while a value of 1.3 to 1.4 is satisfactory in the region of the overshoot.
B.W.

N85-25312# Joint Publications Research Service, Arlington, Va.
SOME NEW PHOTOMETRIC DATA FORM PANORAMIC PICTURES TAKEN BY LUNOKHOD-2 Abstract Only **c91**
V. V. Busarev, V. V. Zasetskiy, Y. A. Kantarovskiy, V. I. Titov, and M. Y. Shevchenko *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 32 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 609-616 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Pictures taken during the third and fourth lunar operating days of the Lunokhod-2 unmanned lunar exploration vehicle were processed photometrically in order to detail the photometric properties of the Moon surface material in its natural state. Photometric markers in the field of view of the remote panoramic photometers were used to find the comparative brightness of the lunar landscape features for the purpose of determining their albedo and the nature of light reflection under changing illumination and observation conditions. The markers were flat metal plates with 39 rectangular brightness fields on the front group in 3 columns, each field column having a set of different gradations of brightness from black to white. Two panoramic pictures were broken down into several sections in order to distinguish the photometric data from the undisturbed surface and that disturbed by the passage of the lunar vehicle. The theoretical and empirical distributions of the photometric function for four of these subsections are plotted graphically, showing that the form of the empirical function is governed primarily by the true photometric relief.
Author

N85-25313# Joint Publications Research Service, Arlington, Va.
APPLICATION OF QUATERNIONS TO PROBLEMS OF SOLID BODY DYNAMICS IN THE ATMOSPHERE Abstract Only **c64**
G. M. Lokhov and S. I. Podzorov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 33 Transl. into ENGLISH from Kosmicheskiya Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 626-629 Original language document announced as A84-48017 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The quaternion method involving the Rodrigues-Hamilton parameters is compared with the directing-cosine method in terms of computational costs and the convenience of machine realization. It is shown that the quaternion method is almost twice as cost-effective. Quaternions are thus-recommended as the most convenient kinematic parameters not only for solving problems of attitude control in space but also for the numerical analysis of rigid-body dynamics in the atmosphere. The use of the quaternion formalism in the kinematic equations also facilitates simulation.
B.J. (IAA)

N85-25314# Joint Publications Research Service, Arlington, Va.
MODELING LONGITUDINAL MOTIONS OF THERMAL O+ AND H+ IONS IN MAGNETIC FIELD TUBE CONVECTIVE THROUGH DAYTIME POLAR CUSP Abstract Only **c46**
L. V. Zinin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 34 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 629-631 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The altitude profile of the concentrations and velocities of thermal ions in a magnetic field tube passing convectively through the day-time polar cusp to the cap undergoes a considerable dynamic restructuring. With the intersection of the cusp for a few minutes, the plasma experiences a short term heating and additional ionization by low energy electrons close to and below the F-layer maximum, after which the field tube relaxes. A modified nonsteady-state polar wind model is used to analyze the longitudinal motions of ions in a field tube about 50,000 km long, both for O(+) and H(+) ions, and to estimate the flow of these ions into the magnetosphere. The results of calculating the fluxes F(O+) and F(H+) as well as the longitudinal velocities V(O+) and V(H+) are summarized in two tables for times of from 0 to 160 minutes after exiting the cusp for altitudes of 600, 1,000, 1,500, 2,050, 4,000, 7,920 and 23,050 km. A hydrodynamic mechanism for the entry of thermal O(+) ions from the polar ionosphere into magnetosphere is described; it must play a considerable part in the observed filling of the magnetosphere with energetic O(+) ions.
Author

N85-25315# Joint Publications Research Service, Arlington, Va.
ELECTRON FLUX WITH ELECTRON ENERGIES ABOVE 40 MeV AT ALTITUDES OF ABOUT 500 km IN REGION WHERE CAPTURE IS POSSIBLE AND OUTSIDE IT WHEN L IS 3 OR GREATER Abstract Only **c46**
L. V. Kurnosova, L. A. Razorenov, and M. I. Fradkin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 35 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4,

Jul.-Aug. 1984 p 632-634 Original language document annouced as A84-48019 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The electron flux for energies greater than 40 to 50 MeV at altitudes of 400 to 500 km in the capture region for a geometric shell parameter of L greater than 3, i.e., close to the outer belt boundary is compared with the electron flux outside the capture region when L greater than 3. Data from the Cosmos-225 (1968) were used. This data reduction was done because of the detection of electrons with energies above 40 MeV in the inner radiation belt and a report of an elevated electron flux in the outer belt. The analysis shows that electrons under these conditions have the same flux levels both inside and outside the possible capture regions. The maximum difference in the flux levels in these two regions cannot exceed about 80 m-2 x s-1 x sr-1. Author

N85-25316# Joint Publications Research Service, Arlington, Va.
BOUNDARY OF MODULATION DIFFUSION AND STOCHASTIC INSTABILITY OF HIGH ENERGY PROTONS IN INNER RADIATION BELT Abstract Only **c46**
I. V. Amirkhanov, A. A. Gusev, V. D. Ilin, A. N. Ilina, and G. I. Pugacheva *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 35-36 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 634-637 Original language document announced as A84-48020 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Modulation diffusion, which is related to the multiple structure of nonlinear resonances between the cyclotron rotation and higher harmonics of the longitudinal particle oscillations can occur in addition to the Arnold diffusion. The limiting case of these instabilities is stochastic instability involving the overlapping of the stochastic layers of nonlinear resonances. The particle losses are described by different diffusion coefficients, depending on the type of instability, and so it is of practical importance to know the boundaries of the regions of existence of these instabilities as precisely as possible. The modulation diffusion and stochastic instability boundary of high energy particles are determined for the actual geomagnetic field using a fourth order Runge-Kutta-Gills approximation and a RYaD-1040 computer for the case of 400 MeV protons. The available experimental data are in agreement with the calculated values, yielding an upper limit of the stochastic instability for pitch angles of less than about 30 deg. Author

N85-25317# Joint Publications Research Service, Arlington, Va.
SPACE RADIATION MONITOR OBSERVATIONS FROM SALYUT-4 ORBITAL STATION Abstract Only **c93**
V. I. Lyagushin, N. A. Mamontova, B. M. Makhmudov, M. A. Sarayeva, P. I. Shavrin, and Y. Y. Yushkov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 36 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 637-639 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Space radiation levels were monitored with the Ryabina equipment from the Salyut-4 space station between December 1974 and July 1975; neutrons and charged particles were recorded with two energy thresholds for the detector. The reduced data from the 3,000 orbits are summarized. The charge particle count rates for the various energy levels are plotted as a function of time. It is noted that such observations, even with omnidirectional detectors, require consideration of both the trajectory and orientation of the satellite. The best observational conditions occurred during the deep solar activity minimum, which enabled an evaluation of the effect of orientation on the Ryabina detectors. All other factors (with the exception of the dependence on longitude and geomagnetic perturbations) do not play a very important part. Author

N85-25318# Joint Publications Research Service, Arlington, Va.
KOVTUNENKO COMMENTS ON VEGA FLIGHT PLAN, INSTRUMENTATION Abstract Only **c19**
Y. Zaytsev *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 37-38 Transl. into ENGLISH from Sov. Estoniya (USSR), 16 Dec. 1984 p 3 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

A brief background commentary on the planning of international space projects to study Halley's Comet is given. The three main objectives of the Vega mission--investigation of Venus with the aid of a landing module and an aerostatic probe, and of Halley's Comet from a flyby trajectory--presents its own specific requirements to the ballistic scheme of flight. The scheme ensures that the landing module (which does not have its own control systems) is guided into Venus' atmosphere with the prescribed entry conditions. The station itself, in the process of the landing module's descent [following its release] and its operation on the surface, must move in a very precise manner in the zone of communications with the module, because the station will serve as a relay for the module's signals to Earth. Modifications made in the Venera stations to toughen them for flying through the comet's coma are discussed, and the stations' instrumentation are described. E.R.

N85-25319# Joint Publications Research Service, Arlington, Va.
COMMENTS ON VEGA MISSION Abstract Only
G. Alimov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 39 Transl. into ENGLISH from Izvestiya (USSR), 16 Dec. 1984 p 2 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

An automatic interplanetary station for conducting a multipurpose program for the study of two heavenly bodies--the planet Venus and the famous Halley's Comet--in a single mission was launched. A television system was installed on the station. It is expected to provide black and white and spectral pictures of different scale of the comet. The spatial resolution of the long focus camera is 180 meters. Data from the TV system is to be used to guide the rotating platform which will aim the instruments at the comet. Mass spectrometers, a magnetometer and an electron analyzer are in operation on the spacecraft. It also has its own radio equipment complex on board--it will permit radioscopy of the comet's plasma and radiolocation of its nucleus, head and tail. The interplanetary station is to transmit information about the heavenly visitor 1.5 to 2 hours before the encounter with it. The entire communications session will last about 3 hours before the voyager from Earth disappears forever in the depths of the universe. Author

N85-25320# Joint Publications Research Service, Arlington, Va.
PRESS CONFERENCE ON FLIGHT OF VEGA SPACECRAFT Abstract Only
In its USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 40 Transl. into ENGLISH from Trud (USSR), 29 Dec. 1984 p 1 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The automatic interplanetary stations Vega-1 and Vega-2, which were launched on 15 and 21 December on their flight to Venus and Halley's Comet are discussed. The development and launching of these spacecraft, which are designed for carrying out a complex program with many stages, represent a new achievement of Soviet science and technology, and give evidence of the high effectiveness of international cooperation in the peaceful exploration of space. The Intercosmos program makes it possible to unite the efforts of nine countries that are taking part in the realization of the project. The space telecommunications center is constantly monitoring the course of the flight of both spacecraft, which will reach the vicinity of Venus in June of 1985 and pass close to Halley's Comet in March of 1986. E.R.

N85-25321# Joint Publications Research Service, Arlington, Va.
RESULTS ON VOLCANISM, SURFACE GEOLOGY FROM VENERA-15, -16 Abstract Only **c91**
B. Konovalov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 41-42 Transl. into ENGLISH from Izvestiya (USSR), 15 Dec. 1984 p 3 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Hot spots on the surface of Venus, which may prove to be active volcanoes are discussed. The automatic stations Venera-15 and Venera-16 are conducting studies of the planet nearest to

use, from orbits as Venus satellites. A 60 meter dish antenna is receiving radio signals from Venus. In addition to pictures of the surface of the previously unexplored polar region, we have obtained a thermal map of practically the entire Northern Hemisphere of Venus. Vast areas in which the temperatures recorded by the radiometer are below the average temperatures for Venus (about 500 degrees Celsius) are shown. These are lava covered regions. Several hot spots with a temperature of about 700 degrees Celsius are discovered. New pictures of the planet's surface show geological formations resembling those on Earth. The pictures are to be matched with the thermal map of Venus for analysis. E.R.

N85-25322# Joint Publications Research Service, Arlington, Va.
INTERPRETATION OF VENUS GRAVITATIONAL ANOMALIES Abstract Only **c91**
Y. A. Tarakanov, N. S. Kambarov, V. A. Prikhodko, and D. R. Bondarenko *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 43 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 617-621 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Doppler tracking of the Pioneer Venus satellite orbit provided accurate data on Venus' gravitational field in the form of harmonic coefficients of the gravitation potential expansion out to the sixth order, but because of the poor precision of the determination of the last three harmonics, only the second and third order coefficients have been published up to now. Three characteristics of the gravitational field are calculated from the anomaly gravitation potential expansion coefficients: the height of the Venus geoid and the gravitation force component at the meridian (the deviation of a plumb line in the plane of the meridian) as well as the attractive force component with respect to the planetary radius. The epicenters and amplitudes of these three characteristics are summarized. Author

N85-25323# Joint Publications Research Service, Arlington, Va.
STRUCTURE AND ORIGIN OF MARTIAN SATELLITES Abstract Only **c91**
V. N. Zharkov, A. V. Kozenko, and S. V. Mayeva *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 44 Transl. into ENGLISH from Astronomicheskiy Vestnik (USSR), v. 18, no. 2, Apr.-Jun. 1984 p 83-99 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The most recent reviews of the structure and origin of the Martian satellites Phobos and Deimos were published by J. A. Burns and J. B. Pollack several years ago. In this article the authors update these reviews on the basis of the most recent observational data and theoretical studies of Mars are discussed. The following tables are given: (1) Parameters of Martian satellites and their orbits; (2) Characteristic accelerations; (3) Abundances of radioactive elements; (4) Thermal models for different thicknesses of regolith layer; and (5) Thermal models of Phobos and Deimos. Different sections deal with structural characteristics, preliminary seismic models, figures and gravity fields, distributions of temperature and heat flow, orbital evolution and origin of the two satellites. A critical review of the published literature is presented. Author

N85-25324# Joint Publications Research Service, Arlington, Va.
DISTRIBUTION OF GRAVITY AND PLUMB LINE DEFLECTION AT MARTIAN SURFACE Abstract Only **c91**
T. G. Maksimova and N. A. Chuykova *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 44-45 Transl. into ENGLISH from Vestnik Moskovskogo Univ., Ser. 3: Fiz., Astron. (USSR), v. 25, no. 1, Jan.-Feb. 1984 p 64-69 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

It is proposed that use be made of the smoothed physical surface of Mars as represented by an expansion in normalized spherical functions; the normalized expansion of Martian gravitational potential is proposed as a model of the gravity field. On this basis it was possible to construct a map of gravity variations at the physical surface of Mars with isolines drawn each 200 mgal, a map of the distribution of plumb line deflections at the physical surface with isolines drawn each 120 inches and a map of the elevations of the physical surface relative to a sphere R0 = 3,389.92 km with its center at the center of mass and with isohypses drawn each 2 km. An interpretation of these maps for different zones on Mars is given. The map of elevations of the physical surface confirms the asymmetric structure of its surface. The range of changes in gravity variations and elevations for the entire Martian surface is 4,620 mgal and 29.4 km respectively. Analysis of the maps and other data allows preliminary conclusions concerning the internal structure of the planet. Author

N85-25325# Joint Publications Research Service, Arlington, Va.
PHOTOMETRIC STUDY OF PLUTO NEAR PERIHELION. PART 2: REFINEMENT OF ROTATION PERIOD: COLOR INDICES Abstract Only **c91**
V. M. Lyutyy and V. P. Tarashchuk *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 45 Transl. into ENGLISH from Pisma v Astron. Zh. (USSR), v. 10, no. 7, Jul. 1984 p 542-548 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Study of brightness changes and color indices of Pluto are made. The observations were made in March-May 1982 and March-July 1983 using observations of 1953-1983 give a refined value of the photometric period of change in planetary brightness. Mean UBV brightness curves for 1980-1983 are constructed on the basis of 50 observations. A considerable reddening is discovered the the brightness maximum (phases 0.6-0.7). At the remaining phases the B-V and U-B color indices are constant. The asymmetry of the brightness curve for Pluto increased since the 1970's. The reddening at the brightness maximum may be attributable to the existence of a red spot in the equatorial region characterized by a reflectivity differing sharply from that for the remaining surface. Author

N85-25326# Joint Publications Research Service, Arlington, Va.
SECOND SOVIET-FRENCH SYMPOSIUM ON SPACE TECHNOLOGY **c51**
V. P. Ovcharov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 46 Transl. into ENGLISH from Sov. Estoniya (USSR), 1 Dec. 1984 p 3 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Results of the latest joint experiments and plans for further scientific cooperation were the focus of attention for participants in the second Soviet-French symposium on space cytology. The subjects of the discussion are of space biology and medicine, space cytology studies the effects of space flight factors, particularly zero gravity, on the activity of life's primary units--animal and plant cells. Functional impairments which are observed in cosmonauts are reviewed during flights are reversible; the disappear following the return to the development of methods and instruments which would make it possible to observe changes on the cellular level directly in orbit are discussed. Researchers in the field of space cytology have to solve a considerable number of complex problems; they have to develop automatic methods for growing cell cultures in orbit and thoroughly ascertain how zero gravity affects the structure, metabolism and functions of cells. Author

N85-25327# Joint Publications Research Service, Arlington, Va.
PLASMODIUM OF MYXOMYCETE AS RESEARCH OBJECT IN GRAVITATIONAL BIOLOGY Abstract Only **c51**
M. G. Tairbekov, S. I. Beylina, D. B. Layrand, A. A. Budnitskiy, and V. V. Lednev *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 48 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Biologicheskaya (USSR), no. 2, Mar.-Apr. 1984 p 48 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The growth, morphology and migration of the plasmodium were studied aboard the Cosmos 1129 biosatellite to ascertain the influence of changes in the concentration of culture medium

components and various in flight factors. Gravitational effects were found which can be attributed primarily to energy processes in the cell. It appears that a myxomycete plasmodium can be regarded as a fundamental research object in gravitational biology for studying the effect of weightlessness on a cell. G.L.C.

N85-25328# Joint Publications Research Service, Arlington, Va.
CONSTRUCTION IN SPACE c18
Aleksey Sergeyevich Gvamichava and Vladimir Alekseyevich Koshelev *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 49-89 refs Transl. into ENGLISH from Stroitelstvo v Kosmose (Novoye v Zhizni, Nauke, Tekh.: Ser. Kosmonavtika, Astron.) (USSR), no. 9, Sep. 1984 p 2-58 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Future development of cosmonautics assumes use of large size constructions in space, both those of independent significance and those constituting different components of space vehicles. The construction technology used for work in orbit and the peculiarities of construction work in space are discussed. G.L.C.

N85-25329# Joint Publications Research Service, Arlington, Va.
COSMONAUTS REPORT ON SPACE WELDING AT CONFERENCE Abstract Only c37
In its USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 90 Transl. into ENGLISH from Rabochaya Gaz. (USSR), 19 Oct. 1984 p 3 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

An evaluation report of a multipurpose hand welding tool for use in space was given by two cosmonauts who used the device. G.L.C.

N85-25330# Joint Publications Research Service, Arlington, Va.
PATON COMMENTS ON RESULTS OF SPACE WELDING TESTS Abstract Only c37
O. Gusev *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 91 Transl. into ENGLISH from Pravda (USSR), 5 Nov. 1984 p 3 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

An assessment of space tests of an electron beam, hand held welding tool is given. Difficulties incurred in the use of the tool were attributed to the space environment and the fact that the process, though it had been practiced in an Earth pressure chamber, would present some initial difficulties in mastering. G.L.C.

N85-25331# Joint Publications Research Service, Arlington, Va.
CZECH INSTITUTE DEVELOPS MICROCOMPUTER FOR SATELLITES Abstract Only c60
In its USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 92 Transl. into ENGLISH from Moskovskaya Pravda (USSR), 17 Oct. 1984 p 4 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

A microcomputer which ensures control of scientific programs on board artificial Earth satellites was developed. G.L.C.

N85-25332# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF TV SYSTEMS FOR SPACECRAFT Abstract Only c32
V. Krichevskiy *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 93 Transl. into ENGLISH from Izv. (USSR), 25 Oct. 1984 p 3 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Soviet spacecraft television systems are reviewed in a historically retrospective manner, beginning with the unmanned Luna-3 mission of 1959, designed to photograph the back side of the Moon, through the Soyuz-1 mission which transmitted TV information to the Salyut-7 space station. G.L.C.

N85-25333# Joint Publications Research Service, Arlington, Va.
OPTIC'S INSTITUTE'S DEVELOPMENT OF EQUIPMENT FOR COMET PROBE Abstract Only c19
N. Orlov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 94-95 Transl. into ENGLISH from Leningradskaya Pravda (USSR), 16 Dec. 1984 p 3 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The development of fifth generation Russar lenses was discussed. Lenses of this type will be employed on spacecraft television systems used for the probing of Halley's comet. G.L.C.

N85-25334# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL MODEL FOR ROLLOUT OF PLANET ROVING VEHICLE FROM LANDING CRAFT Abstract Only c31
Y. I. Grigoryev and S. N. Yermakov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 96 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 543-556 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

A planet roving vehicle rolls down a landing ramp from the descent vehicle onto a planet surface. The motion of the planet rover during rollout is described mathematically, with the following assumptions: The rover consists of an absolutely solid frame, motor and wheels which have inertial mass and are coupled by individual torsional suspensions with longitudinal rocking of the support arms. Each wheel is elastically deformable in three mutually perpendicular directions at the point of contact. The elements of the disembarkation platform ramp are absolutely rigid and the planet's soil is elasto-plastic. The analysis specifies the conditions for the contact of the wheels and the planet surface. The purely theoretical analysis provides equations for the kinetics of vehicle motion during rollout. Author

N85-25335# Joint Publications Research Service, Arlington, Va.
SELECTION OF OPTIMAL CONTROL PROGRAM FOR SOLAR CELL PANELS OF EARTH SATELLITES Abstract Only c44
V. I. Ogarkov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 96-97 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 1, Jan.-Feb. 1984 p 44-52 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The power available from the solar panels of an Earth satellite is porportional to the cosine of the angle a between the line to the Sun and the normal to the panel surface. This paper treats cos(a) as an optimizable parameter in deriving an optimal control routine for solar panels that assures a maximum of specified energy output. Simpler expressions than those found in earlier literature are obtained for cos(a) which significantly simplify the analysis of the optimal programs. Two control programs are analyzed: (1) a program that provides for a maximum of cos(a) with a continuous control function; (2) one which maximizes cos(a), but with a discrete control function. The case in which a specified value of cos(a) is to be achieved with additional constraints (minimization of aerodynamic forces or moments on the satellite) is also analyzed. Analytical expressions are derived for the minimization of the total mass of the solar cells and storage batteries which assure a specific energy capacity. The above analyses are valid for orbits with eccentricities of from 0 to 0.5 and when the angle between the line to the Sun and the orbital plane is from 0 to 90 deg. Author

N85-25336# Joint Publications Research Service, Arlington, Va.
INTERNATIONAL CONFERENCE ON COSPAS-SARSAT SYSTEM Abstract Only c15
Mikhail Chernyshov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 98 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 1 Nov. 1984 p 4 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

A summary of proceedings from the seventh international conference on rescue satellites of the COSPAS-SARSAT system is presented. Systems performance, current equipment, and facilities were discussed. G.L.C.

N85-25337# Joint Publications Research Service, Arlington, Va.
IONOSPHERE EFFECTS MAY REPLACE SOME COMMUNICATIONS SATELLITES Abstract Only c32

V. Lagovskiy *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 103-104 Transl. into ENGLISH from Sotsialisticheskaya Ind. (USSR), 20 Dec. 1984 p 6 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The concept of beaming a powerful radio wave pulse at the ionosphere in order to create a plasma cluster was discussed. This cluster could be used as a mirror to reflect TV waves. Since it would be possible to control the shape of the plasma cloud, signals could be beamed toward very specific areas on the Earth's surface. This system if workable could eliminate the need for many communications satellites. G.L.C.

N85-25338# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF SYSTEM FOR OBSERVING NORTHERN HEMISPHERE ATMOSPHERIC PRESSURE FIELD Abstract Only **c47**
A. I. Belyavskiy and O. M. Pokrovskiy *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 105 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 3-13 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Different methods for optimization of the collection of remote sensing data on the H500 geopotential field in the Northern Hemisphere are discussed. In the different variants in each case the aerological network is taken into account or is excluded. Depending on the satellite measurement scheme selected, the role of the aerological network will vary. For example, some satellite information is presently collected only over the oceans, but is shown that even with availability of data from the surface aerological network remote measurements should be made over continental regions with a relatively low density of such stations. In one version which includes aerological stations the optimization scheme ensures a reduction in the volume of collected information by a factor of 1.5 with an accompanying increase in reliability. Then it is shown that an identical improvement is possible without including the aerological network. A method was developed for organizing optimum spatial schemes for collecting data from remote sensing of the geopotential field with allowance for the aerological network of stations. Author

N85-25339# Joint Publications Research Service, Arlington, Va.
RESEARCH ON ATMOSPHERIC DUST FORMATIONS USING SATELLITE OBSERVATION DATA Abstract Only **c46**
M. V. Ivanchik, S. I. Klyushnikov, V. A. Krovotsyntsev, and A. N. Serebrennikov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 106 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 14-17 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Photoimages received from meteorological satellites in many cases are characterized by a lack of contrast between the sea and land along the western coast of Africa to the south of Cape Verde. A photograph from the Meteor artificial Earth satellite taken on 2 May 1983 is used as an example. In the central part of the photograph there is a cloudless zone in which the boundary between continent and sea is completely obscured. The reasons for this obscuring of the shoreline were investigated by processing the image on an electronic computer. A special program made it possible to define a wedge extending to the west of Africa. Brightnesses were determined in grid squares measuring 0.4 x 0.4 deg. It differed from clouds in its uniformity and lesser brightness of its central part and evidently represented a dust formation. This conclusion was confirmed by on-shore surface-level meteorological observations. B.G.

N85-25340# Joint Publications Research Service, Arlington, Va.
STUDY OF VOLGA RIVER DELTA USING SPACE PHOTOSURVEY MATERIALS Abstract Only **c43**
G. F. Krasnozhon and Y. S. Sokolov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 107 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 27-32 Original language document announced as A84-43204 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The use of space photographs to map deltas is examined, and a hydrographic map of the Volga delta compiled on the basis of space photographs is presented. A comparison of this map with the hydrographic map of 1910 elucidates the dynamics of the Volga delta in the course of 65 years. B.J. (IAA)

N85-25341# Joint Publications Research Service, Arlington, Va.
USE OF SPACE INFORMATION IN PETROLEUM- AND GAS-PROSPECTING WORK (EXAMPLE OF SOUTHERN MANGYSHLAK) Abstract Only **c43**
V. T. Vorobyev and D. S. Orudzheva *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 107-108 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 33-38 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Space information makes it possible to reveal new features of the geology of petroleum and gas regions. The Mangyshlak region was used as an example revealing the effectiveness of its use in exploration work in already known producing regions. High-resolution space photographs were used in studying the distribution and inheritance of structures, vertical neotectonic and recent movements, distribution of zones of compression and dilatation, nature and density of dislocations and relationship of known petroleum and gas deposits. The following photointerpretation operations were performed: ranking of lineaments and annular photoanomalies; analysis of hypsometric position and dissection of defined blocks for determining amplitudes of vertical neotectonic and recent movements; study of microrelief, species composition of vegetation, nature of ground cover and degree of ground moistening. The detected petroleum and gas deposits in the Mangyshlak Basin are associated with zones of major neotectonic faults and recent dilatations, regions of positive recent vertical movements and local weak neotectonic uplifts and territories with average fracturing. B.G.

N85-25342# Joint Publications Research Service, Arlington, Va.
EXAMPLE OF JOINT USE OF DATA FROM SURFACE STUDIES AND SPACE PHOTOGRAPHS IN INVESTIGATING DYNAMICS OF ZONE OF NORTH ZERAVSHAN SEISMOGENIC FAULTS Abstract Only **c43**
A. I. Lavrusevich and D. D. Buzrukov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 108-109 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 39-43 Original language document announced as A84-43206 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

In the North Zeravshan fault zone the most important structural elements are dislocations, movements along which in large part determine the structural plan and geomorphological features of this area. The results of traditional surface geological research, as well as information obtained from medium-scale black-and-white space photographs taken from a Cosmos satellite and the Salyut-6 orbital station, were used. The geological and recent movements of the Zeravshan and Zaknmatabad faults are described. Space photograph interpretation yields interesting and valuable information, such as an unusual configuration of the valleys of the left tributaries of Zeravshan River. The lower reaches Interpretation of the drainage pattern in general revealed the important placements during the recent tectonic stage. The recent tectonic activity manifested in the landscape and apparent on space photographs, light of proposed hydraulic construction on the Zeravshan River for the purpose of regulating its runoff. B.G.

N85-25343# Joint Publications Research Service, Arlington, Va.
RELATIVE GEOLOGICAL INFORMATION YIELD FROM SMALL-SCALE MULTIZONAL SPACE IMAGES (EXAMPLE OF FERGAMA DEPRESSION AND ITS MOUNTAINOUS MARGINS) Abstract Only **c43**
B. G. Azimov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 109 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 44-49 Original language

document announced as A84-43207 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

More than 40 sets of space photographs covering the territory of the Fergana intermont depression and its mountainous margins were analyzed for clarifying the relative yield of geological information and the nature of image generalization on small-scale space photographs depending on change in spectral range. The photographs used were from Meteor-Priroda satellites carrying multispectral TV apparatus and taking in four zones of the visible and near-IR ranges. The spectral brightness coefficients (SBC) was used as the basic parameter. A graph shows the change in spectral brightness coefficients of geological-geomorphological and other natural features as a function of the spectral range used. Curves of the photoanomalies for the four types reveal distinctly different averaged SBC, indicating that in the visible range geological-geomorphological features are easily differentiated on the basis of reflectivity. In the near-IR there is a minimum of information on surface geological-geomorphological features, but lines and bands correlating with zones of deep faults, uplifts and depressions of the buried basement stand out. B.G.

N85-25344# Joint Publications Research Service, Arlington, Va.
CHOICE OF OPTIMUM PAIRS OF SPECTRAL INTERVALS FOR IR-RANGE SURVEY OF EARTH'S SURFACE Abstract Only **c43**
A. V. Arefyev, V. P. Vlasov, and A. B. Karasev *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 110 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 50-59 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

An analysis of the possibilities of a two-channel method for measuring T sub s (surface temperature) and C sub s (temperature contrast) in the atmospheric transparency windows is given. In detecting surface features on the basis of their contrasts and in determining their T sub s it is necessary that the influence of the atmosphere be minimized. This can be achieved when an appropriate choice is made for the spectral intervals of instrument response. It was found that the proper choice of a pair of spectral intervals can reduce the error in the two-channel method to approximately 0.40 K. Two factors are decisive: the intervals must be selected at different ends of the most transparent part of the spectrum 10.3 to 12.5 micron and the corresponding brightness temperatures T sub 1 and T sub 2 must differ sufficiently in magnitude. Specific examples are cited. It is shown that the use of the two-channel method considerably reduces both the error in determining surface temperature and the minimum detectable thermal contrasts in comparison with the single-channel method. Author

N85-25345# Joint Publications Research Service, Arlington, Va.
EVALUATING RADIATION DISTORTIONS OF OPTICAL IMAGE OF EARTH'S SURFACE IN HORIZONTALLY INHOMOGENEOUS ATMOSPHERE Abstract Only **c46**
I. V. Mishin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 111 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 72-76 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

A model of the atmosphere with a vertical stratification of the density of scattering particles (without allowance for its horizontal inhomogeneities) is used in existing algorithms for compensating radiation distortions of the optical image of the Earth's surface. In order to ascertain the practical efficiency of these algorithms, the influence of horizontal variations in the density of scatterers on the brightness of short-wave radiation measured from artificial Earth satellites must be studied. The mathematical model applied in evaluating radiation distortions of the optical image caused by horizontal inhomogeneities in the atmosphere. It was found that horizontal inhomogeneity of the atmosphere exerts the greatest influence on J (brightness of ascending radiation) in the case of small bar q (surface albedo). For observation directions around the nadir the nonlinearity of the system for the transfer of the optical image by the Earth's surface in a horizontally inhomogeneous atmosphere is small and in remote sensing in the optical range of the spectrum a linear model can be used. B.G.

N85-25346# Joint Publications Research Service, Arlington, Va.
VARIABILITY OF COEFFICIENTS OF SPECTRAL BRIGHTNESS OF SOILS Abstract Only **c43**
P. P. Fedchenko and O. A. Borisova *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 111-112 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 77-82 Original language document announced as A84-43212 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The features of the varibility of the spectral-brightness coefficients (SBCs) of certain types of soils are investigated, and a determination is made of the influence of illumination conditions, soil treatment, and moisture on the total variability of soil SBCs. Measurements were made with a lens photometer with an FOV angle of 30 deg. Conversion tables are given for taking into account the simultaneous influence of different combinations of the above-mentioned factors on soil SBCs. B.J. (IAA)

N85-25347# Joint Publications Research Service, Arlington, Va.
EVALUATING IDENTIFIABILITY IN REMOTE SENSING PROBLEMS Abstract Only **c43**
O. Gulyas and T. Farago *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 112-113 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 83-88 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The main problem in image identification in remote sensing is the statistical differentiation of the numerical vectors of a multizonal survey as a function of their actual nature, as in the classification of different varieties of agricultural crops or stages in their growing season. Many factors determine the degree of identifiability, such as fluctuations of the spectral brightness of natural features, signal transformation during its passage through the atmosphere and its transformation in the survey apparatus. Procedures for measuring the probability of error and more general mean risk functionals which can be used in measuring the degree of identifiability are given. The different steps in these procedures are outlined, such as the minimizing of the functional, and a probability density function is proposed. The basis for the overall method is a successive approximations method for functionals of a broad class for measuring the quantity of information. A simple example of identifiability of real video information is given. Author

N85-25348# Joint Publications Research Service, Arlington, Va.
IDENTIFYING LAND USE STRUCTURES OF MULTIZONAL AEROSPACE PHOTOGRAPHS USING DIGITAL DATA PROCESSING Abstract Only **c43**
I. Schmidt and H. Stoye *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 113 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 89-96 Original language document announced as A84-43214 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The land-use patterns of part of the Leipzig region are interpreted by analyzing relationships between the brightnesses of multispectral images (obtained by Salyut-6 in August 1978) transformed into digital form. Interpretation results in the 640 to 680 nm bands are compared with land-use maps, and sufficiently good agreement is obtained. It is noted that the interpreted patterns can serve as the basis for further regional generalization. B.J. (IAA)

N85-25349# Joint Publications Research Service, Arlington, Va.
EXPERIENCE IN AUTOMATION OF DATA PROCESSING IN INTERPRETATION AND DEFINING OF LINEAR ELEMENTS FROM SPACE PHOTOGRAPHS Abstract Only **c43**
V. Y. Goltveger, V. A. Ilin, and N. M. Kunina *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 114 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun.

1984 p 97-105 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Two aspects of geological interpretation of space photographs are examined: automation in the processing of data interpretation, and automated discrimination of linear elements directly from space photographs. The automated image processing system was used. The experiment was done with a space photograph of the Kola Peninsula enlarged to a scale of 1:500,000. The interpretation was used to compile a map of fissures to demonstrate the possibility of automatic processing: computer compilation of a density map, a map of fissures with particular directions and rose diagrams, followed by comparison with results obtained in an experiment with automated discrimination of linear elements. The procedures for preparation of each map are described. Computer interpretation is characterized by great detail. The method, however, has serious limitations, its applicability is limited to cases where most of the brightness drops on a photograph are composed of linear elements and the brightness drops caused by nonlinear elements are negligible. The methods do not differentiate the discriminated linear elements, and it is impossible to reject elements of anthropogenic features. The method is characterized by speed of processing, reproducibility of the results and sensitivity of the procedures.
E.A.K.

N85-25350# Joint Publications Research Service, Arlington, Va.
USING SM-4 OMEGA SYSTEM IN CHECKING AND EDITING DIGITAL TERRAIN INFORMATION Abstract Only c43
P. A. Kalantayev, E. G. Mikhaltsov, V. P. Pyatkin, R. M. Salavatov, and V. G. Chubukov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 115 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 106-114 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The apparatus and programs used in checking and editing of digital terrain information (DTI) in an interactive regime were improved. Interactive graphic displays of the vector type have shortcomings such as limitation of the total length of lines forming the image appearing on the display screen, presence of only one or two colors from which the image is formed, impossibility of output of a half-tone image to the screen, absence of filling of the image of areal features, and others. The limitations were eliminated by the introduction of a new interactive color screen display used with the Omega specialized half-tone color terminal which is included in a complex for the interactive processing of images which operates with an SM-4 computer. Image processing is on an element-by-element basis at the rate of television scanning. A special interface is used in transmission of digital information and controlling information between the SM-4 computer and the Omega terminal. The Omega terminal is part of a complex intended for the processing and reproduction of digital images. The number of jointly processed images is three, with the possibility of expansion to 16.
E.A.K.

N85-25351# Joint Publications Research Service, Arlington, Va.
COMPUTING PARAMETERS CHARACTERIZING POSSIBILITY OF PLANETS FALLING IN STAR CAMERA FIELD OF VIEW DURING SPACE SURVEY Abstract Only c89
I. G. Zhurkin and V. A. Kuzminykh *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 115-116 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geod. i Aerofotosyemka (USSR), no. 3, May-Jun. 1984 p 85-89 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Selection of the optimum conditions and formulation of a program for a survey of planets from a space vehicle requires the knowledge of the probability of entry of planets into the star camera field of view (SCFV) and the time of presence of a planet in the SCFV. It is assumed that the optical axis of the star camera has a random orientation at a fixed moment in time and that the point of intersection of the optical axis of the star camera and the celestial sphere at a given moment in time t is uniformly distributed in the region L of possible values of the angular coordinates alfa, delta (right ascension, declination). By integration of a system of equations of motion for the large planets it is possible to determine the geocentric radius-vector corresponding to the moment in time t and it is possible to ascertain the probability of at least one planet falling in the SCFV. The P (probability) values, are given in five tables. The data make it easy to select the optimum regimes for star camera operation for the registry of at least one planet. A solution of the second problem is presented. It is assumed that: (1) during the considered time interval the planetary motion is Keplerian; (2) the SCFV is a right circular cone whose apex coincides with the center of the Earth's mass; (3) the rotation of the optical axis of the star camera occurs with a period equal to the period of revolution of the satellite carrying the star camera. An expression is derived for the presence of a planet within or at the boundary of the cone at a stipulated time.
Author

N85-25352# Joint Publications Research Service, Arlington, Va.
ONE ASPECT OF DETERMINATION OF DIRECTION OF SPACE SURVEY BASE FROM PHOTOGRAPHS OF PLANETARY SURFACE AND STAR SKY Abstract Only c89
M. I. Shcherbakov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 116-117 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geod. i Aerofotosyemka (USSR), no. 3, May-Jun. 1984 p 76-78 Original language document announced as A84-46465 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

It is shown on the basis of theoretical calculations that satellite photographs of the surface of a planet and of the planet's stellar background is used to determine the direction of the orbital chord, and the direction of a certain alternate vector which is the basis vector of a photogrammetric survey. A pair of detailed schematic diagrams illustrate the basis vectors described.
I.H. (IAA)

N85-25353# Joint Publications Research Service, Arlington, Va.
INTERPRETATION OF SPACE PHOTOLINEAMENTS Abstract Only c48
L. N. Rozanov and I. N. Kalinina *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 117 Transl. into ENGLISH from Sov. Geol. (USSR), no. 9, Sep. 1984 p 81-83 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

A definite pattern of space photolineaments exists, most have northeasterly and northwesterly strikes. The two main systems are traced in all platform regions. Seismic observations along regional profiles help in solving the fracture, the results of interpretation of space survey data should be compared with seismogeological sections along regional profiles. The comparisons show that space photolineaments coincide well with faults both in the upper part of the crust and at considerable depths. It is revealed that almost all lineaments coincide with dislocations or zones of increased permeability discriminated in the seismological sections, although not all the dislocations apparent in the sections are represented on space photographs. It is postulated that only those dislocations appear at the Earth's surface which are related to the most recent tectonic activation. Space photolineaments represent planetary fissuring manifested in the entire crust or its greater part. The dislocations reflected on space photos and in seismic sections are for the most part zones of crustal dilatation and circulation of fluids.
E.A.K.

N85-25354# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF HYDROMETEOROLOGICAL CONDITIONS IN ANTARCTIC COASTAL WATERS ACCORDING TO DATA FROM HYDROLOGICAL AND SATELLITE OBSERVATIONS Abstract Only c43
V. V. Golosov and O. A. Rebenkova *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 118 Transl. into ENGLISH from Vestnik Leningradskogo Univ.: Geol., Geografiya (USSR), no. 3, Sep. 1984 p 96-99 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

A hydrometeorological description of the coastal region of Antarctica is presented based on hydrological data obtained during

the summer navigation season of 1980/1981, together with TV images of the Indian Ocean and Atlantic Ocean sectors of the Antarctic Ocean. A monthly generalization of cloud cover conditions in the coastal area 0 to 40 deg, is given to detect the hydrological front in this region, to trace the destruction of the zone of drifting coastal ice in January and the appearance of young ice in early March, and to evaluate the nature of water circulation on the basis of movement of a gigantic iceberg. It is found that there is a predominance of cloudless or nearly cloudless weather during the summer season. The TV photographs for the southwestern part of the Riiser-Larsen Sea identified the position of the hydrological front. The front separates cold coastal and heated waters in the central part and persists stably at 15 deg E for at least a month. In summer, drifting ice advances into this region from the east, making navigation more difficult. Mapping of the trajectory of movement of an enormous iceberg in February-March 1981 confirms the pattern of circulation determined from hydrological observations. E.A.K.

N85-25355# Joint Publications Research Service, Arlington, Va.
PRELIMINARY PROCESSING OF LASER RANGING DATA FROM LAGEOS ARTIFICIAL EARTH SATELLITE DURING SHORT MERIT PROGRAM OBSERVATION PERIOD Abstract Only **c43**

V. V. Nesterov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 119 Transl. into ENGLISH from Pisma v Astronomicheskiy Zh. (USSR), v. 10, no. 5, May 1984 p 397-400 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The results of LAGEOS ranging during the period August-September 1980 consists of pairs of numbers: topocentric distances and observation times. The problems involved in the processing of these data are complex. The possible approaches which could be employed in preliminary processing are discussed and the procedures adopted are outlined. All data were recorded into a form adopted for computer processing, standardization and resorting. The normal points method was selected to improve accuracy, supplemented by the smoothing method. It is decided to use a smoothing interval of about 150 sec and a smoothing coefficient of 10/5. The distances are deemed suitable for checking various space geodesy algorithms. E.A.K.

N85-25356# Joint Publications Research Service, Arlington, Va.
INCREASING THE ACCURACY OF PROCESSING RADAR PICTURES BY EXCLUDING SYSTEMATIC POINT COORDINATE ERROR COMPONENT Abstract Only **c43**

V. G. Yelyushkin and B. V. Pronin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 119-120 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geod. i Aerofotosyemka (USSR), no. 4, Jul.-Aug. 1984 p 65-72 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The relationship between the coordinates of points on the terrain and on a radar image contains significant random components due to various instabilities, noise and trajectory fluctuations. The near periodic oscillations contain a number of harmonic components. To develop a method for selecting a mathematical apparatus for their exclusion, the influence of trajectory fluctuation parameters on the nature of errors in the coordinates of points of radar images was studied. Secondary processing of radar images by the use of the method developed increases geometric accuracy by 20 to 30%. The effectiveness of the method is greater, the larger the radar image in comparison with the period of trajectory oscillations of the aircraft. E.A.K.

N85-25357# Joint Publications Research Service, Arlington, Va.
CALCULATION OF IMAGE SHIFT IN PANORAMIC PHOTOGRAPHY Abstract Only **c35**

B. M. Miller and M. N. Morskova *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 120 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geod. i Aerofotosyemka (USSR), no. 4, Jul.-Aug. 1984 p 81-89 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

A method is suggested for calculating the image shift in a panoramic photograph applicable to panoramic aerial photographs, though this does not limit the general nature of its applicability. A program was written in FORTRAN for the BESM-6 computer to implement the algorithm. Continuous use of various systems for compensating image shift in panoramic apparatus is proposed for selection of solutions most acceptable for residual shift and design complexities. E.A.K.

N85-25358# Joint Publications Research Service, Arlington, Va.
DETERMINING CHARACTERISTICS OF OPTICAL RADIATION REFLECTORS BASED ON RESULTS OF REMOTE SENSING Abstract Only **c43**

I. F. Pisarevskiy *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 120-121 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geod. i Aerofotosyemka (USSR), no. 4, Jul.-Aug. 1984 p 93-98 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The planning of spacecraft remote sensing systems for studies of the Earth requires the study of the reflective characteristics of natural objects. The problem arises of developing methods of determining informative parameters of objects. This formula is simplified if the characteristic experiment recorded is a measure of the directional properties of reflectors. The directionality coefficient of the reflector was studied. It is determined by recording the back reflection index of an object. A spacecraft flying past a reflector illuminates it with laser radiation from a continuously changing angle. An algorithm is presented for estimating the absorbing properties of obstacles and determining the back reflection of the reflector. The results of experimental measurements determines the parameters of surface unevenness. E.A.K.

N85-25359# Joint Publications Research Service, Arlington, Va.
USE OF SPACE PHOTOGRAPHIC INFORMATION TO MAP PLANT COVER Abstract Only **c43**

T. V. Vereshchaka, B. V. Krasnopevtseva, and V. V. Usova *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 121 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geod. i Aerofotosyemka (USSR), no. 4, Jul.-Aug. 1984 p 99-106 Original language document announced as A85-11815 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

The paper examines the compilation of vegetation maps on the basis of Salyut-5 remote sensing data. Also considered are methodological questions pertaining to the interpretation of images of vegetation cover in the compilation of topographic survey maps. Tables are presented, describing vegetation cover location and dynamics in various altitude zones (150 m to more than 2200 m) and the relationship with relief. B.J. (IAA)

N85-25360# Joint Publications Research Service, Arlington, Va.
MILITARIZATION OF SPACE ACTIVITY IN UNITED STATES **c84**

O. Mikhaylov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 137-144 Transl. into ENGLISH from Politicheskoye Samoobrazovaniye (USSR), no. 6, Jun. 1984 p 115-120 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Policies of the Reagan administration adopted to achieve a strategic advantage over the U.S.S.R. are examined. Civilian departments in the United States are being increasingly drawn into the orbit of the space aspirations of the Pentagon. The expenditures of NASA on military space research are not less than one third of its budget and former military personnel are directing the agency's activity. Space command and reconnaissance systems are being developed and satellites are being used to intercept communications. The strategic aggressive antisatellite system is a violation of the 1972 agreement on antimissile defense systems. Space shuttle is becoming an important means for the testing, collection and in orbit servicing of promising space weapons, including an antimissile defense system. Variants of automatic and manned maneuverable spaceships of a lesser size

and orbital stations are being actively investigated. The intention of the Washington political leaders to break the existing equilibrium of strategic forces by means of the militarization of space is a dangerous turn in the arms race which is a threat to all mankind. A.R.H.

N85-25361# Joint Publications Research Service, Arlington, Va.
LIST OF RECENT SOVIET SPACE LAUNCHES Abstract Only
c15
In its USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 145 Transl. into ENGLISH from Tass (USSR), n.d.,n.p. (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

Launch dates and orbital parameters are listed for Molniya-3, Gorizont and Cosmos satellites 1617 through 1626. A.R.H.

N85-25362# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
7 May 1985 83 p Transl. into ENGLISH from various West European articles
(JPRS-WST-85-014) Avail: NTIS HC A05/MF A01

Developments are reported in biotechnology, computers, robotics, microelectronics, materials science, and aerospace engineering. Technology transfer and scientific and industrial policy are also discussed. For individual titles, see N85-25363 through N85-25364.

N85-25363# Joint Publications Research Service, Arlington, Va.
SWEDISH EQUIPMENT FOR AUTOMATIC DOCKING IN SPACE
Nils-Erik Lindell *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-014) 7 May 1985 p 2-4 Transl. into ENGLISH from Svenska Dagbladet (Stockholm), 22 Mar. 1985 p 4 (For primary document see N85-25362 15-12)
Avail: NTIS HC A05/MF A01

The application of position-sensing photodetectors, invented for use with the handicapped, to facilitate the docking of spacecraft with space stations is discussed. Features of the device that are of interest to NASA are precision of less than a thousandth of a millimeter and a weight between 100 and 500 grams. A.R.H.

N85-25364# Joint Publications Research Service, Arlington, Va.
RESOURCES FOR ROBOTICS RESEARCH IN EUROPE, BY COUNTRY
c37
Pierre Iticsohn *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-014) 7 May 1985 p 31-58 Transl. into ENGLISH from Ind. et Tech. (Paris), Dec. 1984 p 41, 42 and 44 (For primary document see N85-25362 15-12)
Avail: NTIS HC A05/MF A01

Topics cover applications-oriented robotics in West Germany; CAD/CAM research in Sweden; UK research in industrial robots; collaboration among Italian firms; microtechnology in Switzerland; development and use of robots in Spain; and competition among manufacturers as well as funding, programs, and scientists involved in robotics in France. A.R.H.

N85-25609# Joint Publications Research Service, Arlington, Va.
MBB/ERNO'S VIEWS, FUTURE PLANS IN AEROSPACE ACTIVITIES
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-008) 29 Feb. 1984 p 6-7 Transl. into ENGLISH from Frankfurter Allgem. Zeitung (Frankfurt/Main), 20 Jan. 1984 p 15 (For primary document see N85-25606 15-31)
Avail: NTIS HC A04/MF A01

N85-25618# Joint Publications Research Service, Arlington, Va.
FRG OPINION ON SPACELAB BENEFITS, SPACE STATION PARTICIPATION
Berndt Feuerbacher *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-026) 1 Aug. 1984 p 1-8 Transl. into ENGLISH from Bild der Wiss. (Stuttgart), May 1984 p 48-55 (For primary document see N85-25617 15-31)
Avail: NTIS HC A04/MF A01

N85-26596*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
VOYAGE TO URANUS
Mindy Dalrymple *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 35-38 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 22A

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N85-25365 British Aerospace Dynamics Group, Bristol (England). Guidance and Control Dept.
A METHOD OF CALCULATING THE AIM POINT FOR AN UNGUIDED PROJECTILE FIRED AT A MOVING TARGET
G. W. Game Jan. 1982 17 p
(BAe-BT-12717) Copyright. Avail: Issuing Activity

A method by which the initial elevation and azimuth angles and the aim point of the projectile can be determined when the effects of gravity are not neglected is presented. The drag of the projectile is assumed to be proportional to velocity squared acting in the direction opposite to the instantaneous velocity vector. A numerical method of solving the resulting equations is described. Author (ESA)

N85-25366# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A FORTRAN PROGRAM FOR DEEP SPACE SENSOR ANALYSIS M.S. Thesis
G. K. Hasegawa 14 Dec. 1984 143 p
(AD-A151700; AFIT/GSO/OS/84D-5) Avail: NTIS HC A07/MF A01 CSCL 15/3

The deep space satellite tracking network presently in operation is not capable of providing enough observations to monitor all deep space satellites at optimum levels currency. The major reason for this deficiency is the reliance upon the five GEODSS sensors for the bulk of the observation. Although only three of the five sites are presently in operation, the three in operation are only capable of providing 40% of their maximum tracking capacities. Because the GEODSS sensors are optical, they are limited to operation only during darkness and clear skies. If we assume that this 40% of maximum is to continue, the addition of the last two GEODSS sensors will only maintain the present capabilities since the Baker-Nunn cameras are scheduled to be shut down when the last two GEODSS sites are operational. A tool for the above analysis is presented. The program uses as inputs; the distribution of synchronous satellites, total deep space satellite size, sensor locations and sensor visibility limits. The program determines the number of satellites visible to each individual sensor, the number of tracks required for each sensor, identifies areas of overlapping coverage between adjacent sensors, and the number of satellites within the areas of overlapping coverage. GRA

N85-25294# Joint Publications Research Service, Arlington, Va.
SOME NUMERICAL ESTIMATES OF PERTURBATION OF ORBITAL ELEMENTS OF ARTIFICIAL EARTH SATELLITE WITH TOTAL DYNAMIC SYMMETRY ABOUT ROTATING ASPHERICAL EARTH Abstract Only
D. Z. Koyenov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 18 Transl. into ENGLISH from Dokl. Akad. Nauk Tadzhikskoy SSR (USSR), v. 27, no. 6, Jun. 1984 p 314-317 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25297# Joint Publications Research Service, Arlington, Va.
USING VELOCITY VECTOR IN DETERMINING KEPLERIAN ORBIT OF GEODECTIC SATELLITE Abstract Only
I. V. Onkov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 20-21 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geodeziya i Aerofotosyemka (USSR), no. 2, Mar.-Apr.

1984 p 49-55 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25301# Joint Publications Research Service, Arlington, Va.
MINIMAX PROBLEM OF ESTIMATING TRAJECTORY PARAMETERS IN CONTINUOUS FORMULATION Abstract Only
M. L. Lidov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 23-24 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 483-498 Original language document announced as A84-49001 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25302# Joint Publications Research Service, Arlington, Va.
RESONANT ROTATIONS OF SATELLITE IN POLAR ORBIT IN MAGNETIC AND GRAVITATIONAL FIELDS Abstract Only
V. V. Beletskiy and A. N. Shlyakhtin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 24 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 499-506 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25303# Joint Publications Research Service, Arlington, Va.
MULTISTEP ORBITAL CORRECTION ALGORITHMS FOR AN EARTH SATELLITE USING LOW THRUST ENGINE Abstract Only
V. V. Vasilyev and V. V. Salmin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 25 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 507-519 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25656# Joint Publications Research Service, Arlington, Va.
APPLICATION OF PERTURBATION THEORY TO PROBLEM IN ORBITAL THEORY
Zhou Huanwen *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-013) 1 May 1985 p 54-59 refs Transl. into ENGLISH from Shuxue Wuli Xuebao (Wuhan), no. 1, 20 Mar. 1984 p 39-43 (For primary document see N85-25652 15-31)
Avail: NTIS HC A07/MF A01

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N85-25367# Naval Postgraduate School, Monterey, Calif.
SUPERSONIC MISSILE SEEKER LENS SYSTEM USING GRADIENT INDEX MATERIAL FOR FIRST ELEMENT LENS M.S. Thesis
D. S. Davidson Sep. 1984 121 p
(DARPA Order 4035)
(AD-A151476; NPS67-84-016) Avail: NTIS HC A06/MF A01 CSCL 16/4

The design of a supersonic missile seeker lens system using an aerodynamically efficient lens, a scanning mirror and detector was accomplished through the use of ray-tracing routines. The design of the first element lens uses a gradient in refractive index to overcome the severe handicap that the pointed shape imposes. This problem has been previously solved for positive orientations of the center of symmetry of the Gradient Refractive Index (GRIN) material with respect to the lens. In this thesis the negative orientations are resolved and the lens is studied for a range of orientations and strengths of gradient. The best lens is then used in conjunction with the mirror and detector in a ray-tracing scheme. Such a system was found to be feasible and worthy of further study. GRA

N85-25295# Joint Publications Research Service, Arlington, Va.
X-RAY EXPERIMENT ON PROGNOZ-9 ARTIFICIAL EARTH SATELLITE Abstract Only
M. I. Kudryavtsev and S. I. Svertilov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 19 Transl. into ENGLISH from Vestn. Moskovskogo Univ., Ser. 3: Fiz., Astron. (USSR), v. 25, no. 5, Sep.- Oct. 1984 p 81-88 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25309# Joint Publications Research Service, Arlington, Va.
ELECTRIC POTENTIAL OF SATELLITE IN ELECTRON EMITTING EXPERIMENTS IN INITIAL STAGE OF ELECTRON BEAM INJECTION IN STEADY-STATE MODE Abstract Only
V. A. Fedorov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 30 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 588-593 Original language document announced as A84-48011 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25336# Joint Publications Research Service, Arlington, Va.
INTERNATIONAL CONFERENCE ON COSPAS-SARSAT SYSTEM Abstract Only
Mikhail Chernyshov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 98 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 1 Nov. 1984 p 4 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25361# Joint Publications Research Service, Arlington, Va.
LIST OF RECENT SOVIET SPACE LAUNCHES Abstract Only
In its USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 145 Transl. into ENGLISH from Tass (USSR), n.d.,n.p. (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25554# Joint Publications Research Service, Arlington, Va.
CALENDAR OF ARIANE LAUNCHES 1984 - 1987
In its West Europe rept.: Sci. and Technol. (JPRS-WST-84-012) 18 Apr. 1984 p 3-5 Transl. into ENGLISH from AFP Sciences (Paris), 23 Feb. 1984 p 14-15 (For primary document see N85-25552 15-31)
Avail: NTIS HC A04/MF A01

N85-25613# Joint Publications Research Service, Arlington, Va.
FRANCE OFFICIALLY PROPOSES DEVELOPMENT OF ARIANE 5 TO ESA
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-027) 17 Aug. 1984 p 3-9 Transl. into ENGLISH from AFP Sci. (Paris), 21 Jun. 1984 p 10-15 (For primary document see N85-25612 15-31)
Avail: NTIS HC A04/MF A01

N85-25619# Joint Publications Research Service, Arlington, Va.
FRENCH CNES OFFICIAL DESCRIBES ARIANE V LAUNCHER
R. Vignelles *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-026) 1 Aug. 1984 p 9-26 Transl. into ENGLISH from L'Aeron. et l'Astronautique (Paris), no. 105, Feb. 1984 p 24-31 Original language doc. previously announced in IAA as

A85-10538 (For primary document see N85-25617 15-31)
Avail: NTIS HC A04/MF A01

N85-25640# Joint Publications Research Service, Arlington, Va.
DETAILS ON SPOT REMOTE SENSING SATELLITE PROPULSION UNIT
J. C. Corai *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-009) 21 Mar. 1984 p 1-18 Transl. into ENGLISH from L'Aeron. et l'Astronautique (Paris), no. 103, Jun. 1983 p 32-40 (For primary document see N85-25639 15-31)
Avail: NTIS HC A04/MF A01

N85-26606*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PROGRAMMING FOR PIONEER 12
Bruce C. Shem *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 93-97 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 22B

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N85-25368*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NASA R AND T AEROSPACE PLANE VEHICLES: PROGRESS AND PLANS
S. C. Dixon May 1985 239 p refs Presented at the SAE Aerospace Vehicle Requirements Conf., Arlington, Va., 20-23 May 1985
(NASA-TM-86429; NAS 1.15:86429) Avail: NTIS HC A11/MF A01 CSCL 22B

Progress made in key technologies such as materials, structures, aerothermodynamics, hypersonic aerodynamics, and hypersonic airbreathing propulsion are reported. Advances were made in more generic, areas such as active controls, flight computer hardware and software, and interdisciplinary analytical design methodology. These technology advances coupled with the development of and experiences with the Space Shuttle make feasible aerospace plane-type vehicles that meet the more demanding requirements of various DOD missions and/or an all-weather Shuttle II with reduced launch costs. Technology needs and high payoff technologies, and the technology advancements in propulsion, control-configured-vehicles, aerodynamics, aerothermodynamics, aerothermal loads, and materials and structures were studied. The highest payoff technologies of materials and structures including thermal-structural analysis and high temperature test techniques are emphasized. The high priority technology of propulsion, and plans, of what remains to be done rather than firm program commitments, are briefly discussed. E.A.K.

N85-25369*# LinCom Corp., Los Angeles, Calif.
SHUTTLE COMMUNICATIONS AND TRACKING SYSTEMS MODELING AND TDRSS LINK SIMULATIONS STUDIES Final Report
C. M. Chie, K. Dessouky, W. C. Lindsey, C. S. Tsang, and Y. T. Su May 1985 313 p refs
(NASA-CR-171861; NAS 1.26:171861; TR-8411-1) Avail: NTIS HC A14/MF A01 CSCL 22B

An analytical simulation package (LinCsim) which allows the analytical verification of data transmission performance through TDRSS satellites was modified. The work involved the modeling of the user transponder, TDRS, TDRS ground terminal, and link dynamics for forward and return links based on the TDRSS performance specifications (4) and the critical design reviews. The scope of this effort has recently been expanded to include the effects of radio frequency interference (RFI) on the bit error rate (BER) performance of the S-band return links. The RFI environment and the modified TDRSS satellite and ground station hardware are being modeled in accordance with their description in the applicable documents. G.L.C.

N85-25370# RAND Corp., Santa Monica, Calif.
SHUTTLE FLEET OPERATIONS: A SIMULATION ANALYSIS Interim Report
D. Leinweber Oct. 1984 65 p
(Contract F49620-82-C-0018)
(AD-A151383; RAND/N-1761-1-AF) Avail: NTIS HC A04/MF A01 CSCL 22/2

This note documents a two-part analysis of the reliability of the Space Transportation System (STS). The first part is a strictly statistical examination of the inherent bounds on reliability prediction based on accumulated mission experience as the shuttle program evolves. The results of this analysis suggest that it will take a long history of successes to firmly establish a high shuttle reliability, and that therefore, some contingency provisions should be retained during the early part of the program at least. The second phase of the analysis is aimed at gaining some insight into the operational consequences of less than perfect reliability. This analysis suggests that the risks from the uncertainties surrounding loss or retirement of orbiters, stand-down periods, and delays in refurbishment and turnaround can be reduced by supplementing the four-orbiter STS fleet with additional orbiters or an alternative launch system. Author (GRA)

N85-25601# Joint Publications Research Service, Arlington, Va.
COSTS, PAYLOAD OF ARIANE, US SPACE SHUTTLE COMPARED
Roger E. Lo *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-007) 21 Feb. 1984 p 1-4 refs Transl. into ENGLISH from DFVLR-Nachr. (Cologne), Nov. 1983 p 33-36 (For primary document see N85-25600 15-31)
Avail: NTIS HC A03/MF A01

N85-25625# Joint Publications Research Service, Arlington, Va.
FLIGHT TESTS OF EXPERIMENTAL SHUTTLE CRAFT DESCRIBED
Miroslaw Frydrych *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 1-2 refs Transl. into ENGLISH from Technika Lotnicza i Astronautyczna (Warsaw), no. 3, Mar. 1984 p 13 (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

N85-26592*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PRIMATE EXPERIMENTS ON SLS-1
Julie Aochi *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 9-14 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 22A

N85-26597*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A BRIEF DESCRIPTION OF THE TWO PRIMATE EXPERIMENTS TO BE CARRIED OUT ON SL-4
Louise Elsea *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 41-44 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 22A

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N85-25371 Autophon A.G., Solothurn (West Germany).
SYSTEM FOR RADIO REMOTE CONTROL OF DROPPING

BOMBS Patent [ANORDNUNG ZUR FUNK-FERNSTEUERUNG VON ABWURFBOMBEN]
Alfred Scheidegger and Emil Zellweger Bern Swiss Patent Office Issued 15 Nov. 1983 3 p In GERMAN Filed 13 Mar. 1972 (CH-639335-A5; Intl-Cl.B64D-1/06; Intl-Cl.F42C-15/40; Intl-Cl.F42C-15/12) Avail: Swiss Patent Office

A system for radio control of a series of bombs which have to be dropped shortly one after another was developed. The bombs are dropped at short intervals. The first contains a transmitter and serves as leading bomb; the other bombs contain a receiver. During its fall the leading bomb emits unmodulated and uncoded pulses, and the receivers avoid ignition as long as the pulses are received. The ignition occurs when the leading bomb reaches the ground and detonates, interrupting the pulse emission. An air propeller delivers the energy for transmitter and receivers.
Author (ESA)

N85-25372# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SATELLITE RECEPTION OF REENTRY VEHICLE TELEMETRY M.S. Thesis
R. W. White Dec. 1984 126 p
(AD-A151851; AFIT/GE/ENG/84D-69) Avail: NTIS HC A07/MF A01 CSCL 17/2

This thesis is intended to be a tool for planners of a reentry vehicle to satellite telemetry link. However, it may be a useful resource to anyone interested in satellite communications, especially those who wish to examine the S-band capability of the Tracking and Data Relay Satellite (TDRS). The thesis should be a stand alone reference for a general overview of the problems concerned. Most of the major problems involved in establishing a telemetry link have been set forth in this one source. The reader is briefed on each problem in sufficient detail to gain some insight as to how the problems affect the quality of the link, how the problems are related to each other, and some of the tradeoffs that can be performed. A broad range of antenna and transmitter combinations are examined, and their performances are compared. Specifically, this thesis examines free space loss, rain loss, gain and 3 dB beamwidth of parabolic, slot, and dipole antennas, parabolic antenna footprint on the Earth, the concept of received signal strength, reentry vehicle and satellite characteristics, increasing transmit power, varying frequency from 1 to 10 GHz, increasing antenna efficiency, and increasing receiver sensitivity.
GRA

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-25373 Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
SATELLITE STRUCTURE Patent [SATELLITENSTRUKTUR]
Manfred Westphal and Wolfgang Pritzler Bern Swiss Patent Office Issued 15 May 1984 7 p In GERMAN Filed 6 Mar. 1979, Priority Date 8 Apr. 1984 at DE 2815216
(CH-642922-A5; Intl-Cl.B64G-1/10) Avail: Swiss Patent Office

A satellite structure consisting of a carrying grid built of linkage nodes and linkage rods and connected to modular boxes and a transition adapter was developed. Bearing points, arranged in the linkage nodes carry some of the modular boxes. The other modular boxes are connected to the bearing points in the grid structure by bolts or screws and/or clamp straps. The adaptor enables a transition from a circular cross section to a four-point attachment to the carrying grid. The linkage rods are made of a thermostable material.
Author (ESA)

N85-25374*# National Aeronautics and Space Administration, Washington, D. C.
CONSTRUCTION IN SPACE
A. S. Gvamichava and V. A. Koshelev Dec. 1984 62 p refs Transl. into ENGLISH of the book "Stroitelstvo v Kosmose, no. 9/1984" Moscow, Znaniye, 1984 p 1-58 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77630; NAS 1.15:77630) Avail: NTIS HC A04/MF A01 CSCL 22B

The development of large space structures to be used in space, as independent elements, and as different components of space vehicles is proposed. The construction technology of building these structures in orbit, and their design features are discussed. E.A.K.

N85-25375*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
THE INVESTIGATION OF TETHERED SATELLITE SYSTEM DYNAMICS Quarterly Report, 1 Dec. 1984 - 14 Feb. 1985
Enrico Lorenzini Mar. 1985 117 p refs
(Contract NAS8-36160)
(NASA-CR-171433; NAS 1.26:171433; QR-2) Avail: NTIS HC A06/MF A01 CSCL 22B

A progress report is presented that deals with three major topics related to Tethered Satellite System Dynamics. The SAO rotational dynamics computer code was updated. The program is now suitable to deal with inclined orbits. The output has been also modified in order to show the satellite Euler angles referred to the rotating orbital frame. The three-dimensional high resolution computer program SLACK3 was developed. The code simulates the three-dimensional dynamics of a tether going slack taking into account the effect produced by boom rotations. Preliminary simulations on the three-dimensional dynamics of a recoiling slack tether are shown in this report. A program to evaluate the electric potential around a severed tether is immersed in a plasma. The potential is computed on a three-dimensional grid axially symmetric with respect to the tether longitudinal axis. The electric potential variations due to the plasma are presently under investigation.
B.W.

N85-25376*# Scientific Systems, Inc., Cambridge, Mass.
AUTOMATIC RENDEZVOUS AND DOCKING SYSTEMS FUNCTIONAL AND PERFORMANCE REQUIREMENTS
1 Mar. 1985 16 p ref
(Contract NAS9-17274)
(NASA-CR-171866; NAS 1.26:171866; DRL-SE-1169T) Avail: NTIS HC A02/MF A01 CSCL 22B

A generalized mission design scheme which utilizes a standard mission profile for all OMV rendezvous operations, recognizes typical operational constraints, and minimizes propellant penalties due to nodal regression effects was developed. This scheme has been used to demonstrate a unified guidance and navigation maneuver processor (the UMP), which supports all mission phases through station-keeping. The initial demonstration version of the Orbital Rendezvous Mission Planner (ORMP) was provided for evaluation purposes, and program operation was discussed.G.L.C.

N85-25377*# Control Dynamics Co., Huntsville, Ala.
DEFINITION OF GROUND TEST FOR VERIFICATION OF LARGE SPACE STRUCTURE CONTROL Progress Report, 1 - 31 Mar. 1985
Sherman M. Seltzer and George B. Doane, III 4 Apr. 1985 18 p
(Contract NAS8-35835)
(NASA-CR-171438; NAS 1.26:171438; PR-10) Avail: NTIS HC A02/MF A01 CSCL 22B

Directions regarding the analytical models were received. A counter balance arm with weights was added at the top of the ASTROMAST to offset the arm with the gimbals. In addition to this model, three more models were requested from MSFC:

structure as in the revised model with the addition of lumped masses at bays 46 and 91 of the ASTROMAST; cantilevered cruciform structure with lumped masses at bays 46 and 91, and an all up cruciform structure with lumped masses at bays 46 and 91. Figures for each model and their corresponding natural frequencies and general mode shapes associated with these frequencies are included. The drawbar in use in the cruciform models must be incorporated into the antenna and ASTROMAST models. The total tensile load carrying capability of the ASTROMAST is approximately 840 pounds. A.R.H.

N85-25378# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
TWO-PHASE FLUID THERMAL TRANSPORT FOR SPACECRAFT Final Report, 1 Oct. 1982 - 30 Sep. 1983
R. E. Eastman, C. J. Feldmanis, W. L. Haskin, and K. L. Weaver Wright-Patterson AFB, Ohio AFWAL Oct. 1984 102 p
(AD-A151316; AFWAL-TR-84-3028) Avail: NTIS HC A06/MF A01 CSCL 22/2

The research effort described in this report was conducted to begin an analysis of the phase change and flow processes of interest for spacecraft thermal transport loops. Pertinent literature was examined to identify the limits of existing theory and experimental results. It was found that data from low gravity force experiments are very limited, and much of this data is not adequately explained by existing analytical methods. The basic process of bubble growth in a liquid was analyzed, and good correlation was obtained with previous experimental data of other investigators. An expanded explanation of the forces causing bubble separation from a heated surface indicates conditions under which pool bubbling may be possible in a weightless environment. Standard equations for pressure gradients and heat transfer coefficients in boiling and condensing systems were assembled as a starting point for further analysis. Criteria for predicting flow pattern boundaries were also reviewed, and implications for low effective gravity environments are discussed. Finally, initial concepts for two-phase heat transfer loops on a spacecraft are briefly discussed with indications of the need foe continued analytical and experimental work. GRA

N85-25379# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AUTONOMOUS STATE DETERMINATION FOR AN EARTH ORBITING SATELLITE USING HORIZON AND STAR SENSORS M.S. Thesis
J. E. Ward, Jr. Dec. 1984 170 p
(AD-A151827; AFIT/GA/AA/84D-12) Avail: NTIS HC A08/MF A01 CSCL 17/7

An autonomous state determination system is developed for an Earth orbiting satellite using horizon sensors and star trackers. The horizon sensors detect the Earth and establish the local vertical reference, while either one or two star trackers make angular sightings of known stars. These sightings constitute the observation function used in special perturbations differential correction techniques to produce the state estimate. Two modes are used, batch and sequential. The batch method uses nonlinear least squares estimation while the sequential mode uses Bayes estimation. Both modes rely upon residuals to form state corrections. Truth model generated sightings are used to form residuals. Three separate estimation versions are tested: nonlinear least squares, Bayes estimation with fixed data, and Bayes estimation with changing data. Each of these three routines exist in one and two star tracker versions. Eleven test cases are run with the different estimator routines and indicate better than anticipated results. Problem areas include estimator dependence upon accurate initial estimate, sensitivity to specific perturbed orbital elements, and varying minimum number of data points for Bayes estimator. GRA

N85-25380# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ANALYSIS OF SPACE STATION OPERATIONS IN THE SPACE DEBRIS ENVIRONMENT M.S. Thesis
B. M. Waechter Dec. 1984 268 p
(AD-A151872; AFIT/GOR/OS/84D-15) Avail: NTIS HC A12/MF A01 CSCL 22/2

Analysis of Space Station operations in the space debris environment involved the conceptualization and development of a simulation model to provide initial estimates concerning Space Station survivability and fuel requirements. An initial review of recent literature indicated the relative insensitivity of satellite-of-interest collision probability calculations to modeling debris density with varying complexity. In addition, the literature identified that the debris population unable to be detected by current means, the rate of unintentional explosions and inter-object collisions, and the dynamics of these occurrences are important system parameters on which little is known. Conceptual model elements significantly affecting the space debris population and lending themselves to modeling were included in the discrete-event SLAM simulation model developed. The model simulated space debris environment dynamics up to Space Station system maturity. Model results indicated that at least one collision could occur within the first 29 years of Space Station operations. The results stress the need for greater consideration of the survivability of large, long-term spacecraft in such an environment, and for greater ground-tracking or on-board debris detection capabilities. GRA

N85-25381# MATRA Service Aerodynamique, Toulouse (France). Dept. d'Etudes et Avant Projets Systeme.
ESABASE EXTENSION TO SPACECRAFT CHARGING ANALYSIS. PHASE 1: NASCAP SOFTWARE (VAX VERSION) Final Report
M. Frezet 14 May 1984 48 p refs
(Contract ESTEC-5632/83/NL-PP)
(ESA-CR(P)-1968; MATRA-CMT-RT101/021) Avail: NTIS HC A03/MF A01

A VAX version of the NASCAP code was developed for use at system level to investigate spacecraft charging in geosynchronous orbit and in test tanks. The program was applied to the HIPPARCOS spacecraft. Author (ESA)

N85-25382# European Space Agency, Paris (France).
NUMERICAL EXPERIMENTS ON FLEXIBLE SPACECRAFT WITH THE AID OF THE DYNAMIC CONTROL AND ANALYSIS PACKAGE (DCAP)
C. Arduini (Rome Univ.), F. Graziani (Rome Univ.), and W. R. Burke, ed. Dec. 1984 54 p refs
(ESA-STM-229; ISSN-0379-4075) Avail: NTIS HC A04/MF A01

Results obtained with the Dynamic Control and Analysis Package (DCAP) are compared with theory for the structural engineering of a spinning satellite with two elastic appendages mounted symmetrically along the spin axis. This is relevant per se and because it can represent a first approximation to a satellite with flexible solar panels. It also provides a means of understanding gyroscopic coupling. Good agreement between the eigenvalues of the system and a variety of test cases obtained from direct analytical treatment with those obtained with DCAP is obtained. The influence of the number of joints on a representation of the flexible members was checked, DCAP produces satisfactory results under many different conditions. The influence of the number of modes was also checked. A routine for modeling flexible beams was implemented. Author (ESA)

N85-25328# Joint Publications Research Service, Arlington, Va.
CONSTRUCTION IN SPACE
Aleksey Sergeyevich Gvamichava and Vladimir Alekseyevich Koshelev *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 49-89 refs Transl. into ENGLISH from Stroitelstvo v Kosmose (Novoye v Zhizni, Nauke, Tekh.: Ser. Kosmonavtika, Astron.) (USSR), no. 9, Sep. 1984 p 2-58 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25608# Joint Publications Research Service, Arlington, Va.
EUROPEAN VIEWS DIFFER ON SPACE STATION CONCEPT
Guenter Paul *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-008) 29 Feb. 1984 p 3-5 Transl. into ENGLISH from Frankfurter Allgem. Zeitung (Frnakfurt/Main), 11 Jan. 1984

p 25 (For primary document see N85-25606 15-31)
Avail: NTIS HC A04/MF A01

N85-26601*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GALILEO
Cynthia Hwang *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 63-66 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 22B

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N85-25318# Joint Publications Research Service, Arlington, Va.
KOVTUNENKO COMMENTS ON VEGA FLIGHT PLAN, INSTRUMENTATION Abstract Only
Y. Zaytsev *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 37-38 Transl. into ENGLISH from Sov. Estoniya (USSR), 16 Dec. 1984 p 3 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25333# Joint Publications Research Service, Arlington, Va.
OPTIC'S INSTITUTE'S DEVELOPMENT OF EQUIPMENT FOR COMET PROBE Abstract Only
N. Orlov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 94-95 Transl. into ENGLISH from Leningradskaya Pravda (USSR), 16 Dec. 1984 p 3 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-25383*# Aerojet Techsystems Co., Sacramento, Calif.
OXYGEN-HYDROGEN THRUSTERS FOR SPACE STATION AUXILIARY PROPULSION SYSTEMS Final Report
D. K. Berkman Aug. 1984 109 p refs
(NASA-CR-175691; JPL-9950-974; NAS 1.26:175691; FR-956457-F-1) Avail: NTIS HC A06/MF A01 CSCL 21H

The feasibility and technology requirements of a low-thrust, high-performance, long-life, gaseous oxygen (GO2)/gaseous hydrogen (GH2) thruster were examined. Candidate engine concepts for auxiliary propulsion systems for space station applications were identified. The low-thrust engine (5 to 100 lb sub f) requires significant departure from current applications of oxygen/hydrogen propulsion technology. Selection of the thrust chamber material and cooling method needed or long life poses a major challenge. The use of a chamber material requiring a minimum amount of cooling or the incorporation of regenerative cooling were the only choices available with the potential of achieving very high performance. The design selection for the injector/igniter, the design and fabrication of a regeneratively cooled copper chamber, and the design of a high-temperature rhenium chamber were documented and the performance and heat transfer results obtained from the test program conducted at JPL using the above engine components presented. Approximately 115 engine firings were conducted in the JPL vacuum test facility, using 100:1 expansion ratio nozzles. Engine mixture ratio and fuel-film cooling percentages were parametrically investigated for each test configuration. Author

N85-25384*# United Technologies Corp., South Windsor, Conn. Power Systems Div.
LONG-LIFE HIGH PERFORMANCE FUEL CELL PROGRAM Interim Report, 28 May 1981 - 31 Oct. 1984
R. E. Martin Feb. 1985 187 p refs
(Contract NAS3-22234)
(NASA-CR-174874; NAS 1.26:174874; FCR-6853) Avail: NTIS HC A09/MF A01 CSCL 10B

A multihundred kilowatt Regenerative Fuel Cell for use in a space station is envisioned. Three 0.508 sq ft (471.9 cm) active area multicell stacks were assembled and endurance tested. The long term performance stability of the platinum on carbon catalyst configuration suitability of the lightweight graphite electrolyte reservoir plate, the stability of the free standing butyl bonded potassium titanate matrix structure, and the long life potential of a hybrid polysulfone cell edge frame construction were demonstrated. A 18,000 hour demonstration test of multicell stack to a continuous cyclical load profile was conducted. A total of 12,000 cycles was completed, confirming the ability of the alkaline fuel cell to operate to a load profile simulating Regenerative Fuel Cell operation. An orbiter production hydrogen recirculation pump employed in support of the cyclical load profile test completed 13,000 hours of maintenance free operation. Laboratory endurance tests demonstrated the suitability of the butyl bonded potassium matrix, perforated nickel foil electrode substrates, and carbon ribbed substrate anode for use in the alkaline fuel cell. Corrosion testing of materials at 250 F (121.1 C) in 42% wgt. potassium identified ceria, zirconia, strontium titanate, strontium zirconate and lithium cobaltate as candidate matrix materials. A.R.H.

N85-25385*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MANRATING ORBITAL TRANSFER VEHICLE PROPULSION
Larry P. Cooper 1985 14 p refs Proposed for presentation at the 21st Joint Propulsion Conf., Monterey, Calif., 8-10 Jul. 1985; sponsored by AIAA, SAE and ASME
(NASA-TM-87019; E-2570; NAS 1.15:87019) Avail: NTIS HC A02/MF A01 CSCL 21H

The expended capabilities for Orbital Transfer Vehicles (OTV) which will be needed to meet increased payload requirements for transporting materials and men to geosynchronous orbit are discussed. The requirement to provide manrating offers challenges and opportunities to the propulsion system designers. The propulsion approaches utilized in previous manned space vehicles of the United States are reviewed. The principals of reliability analysis are applied to the Orbit Transfer Vehicle. Propulsion system options are characterized in terms of the test requirements to demonstrate reliability goals and are compared to earlier vehicle approaches. E.A.K.

N85-25386*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPACE STATION PROPULSION: THE ADVANCED DEVELOPMENT PROGRAM AT LEWIS
Robert E. Jones 1985 14 p refs Proposed for presentation at the 21st Joint Propulsion Conf., Monterey, Calif., 8-10 Jul. 1985; sponsored by AIAA, SAE and ASME
(NASA-TM-86999; E-2544; NAS 1.15:86999) Avail: NTIS HC A02/MF A01 CSCL 21H

A reference configuration was established for the initial operating capability (IOC) station. The reference configuration has assumed hydrazine fueled thrusters as the propulsion system. This was to establish costing and as a reference for comparison when other propulsion systems are considered. An integral part of the plan to develop the Space Station is the advanced development program. The objective of this program is to provide advanced technology alternatives for the initial and evolutionary Space Station which optimize the system's functional characteristics in terms of performance, cost, and utilization. The portion of the Advanced Development Program that is concerned with auxiliary propulsion and the research and programmatic activities conducted are discussed. E.A.K.

N85-25387*# TRW, Inc., Redondo Beach, Calif.
HIGH FREQUENCY PLASMA GENERATOR FOR ION THRUSTERS Final Report, Sep. 1980 - Apr. 1983
Heinz Goede, William F. DiVergilio, Verryl V. Fosnight, and G. Komatsu Jul. 1984 74 p refs
(Contract NAS3-22473)
(NASA-CR-174772; NAS 1.26:174772) Avail: NTIS HC A04/MF A01 CSCL 21C

A program to experimentally develop two new types of plasma generators for 30 cm electrostatic argon ion thrusters is presented. The two plasma generating methods were radio frequency induction (RFI), operating at an input power frequency of 1 MHz, and electron cyclotron heating (ECH) at an operating frequency of 5.0 GHz. Both generators utilize multiline cusp permanent magnet configurations for plasma confinement and beam profile optimization. The program goals were to develop a plasma generator with the characteristics of high electrical efficiency and simplicity of operation while maintaining the reliability and durability of the conventional hollow cathode plasma sources. The RFI plasma generator achieved minimum discharge losses of 120 eV/ion while the ECH generator obtained 145 eV/ion, assuming a 90% ion optical transparency of the electrostatic acceleration system. E.A.K.

N85-25388# Naval Postgraduate School, Monterey, Calif.
AN APPARATUS FOR SIZING PARTICULATE MATTER IN SOLID ROCKET MOTORS M.S. Thesis
R. K. Harris Jun. 1984 88 p
(AD-A151282) Avail: NTIS HC A05/MF A01 CSCL 21/9

A light scattering apparatus to measure particle size (D32) in a solid rocket motor was improved. Multiple consecutive scans of two photodiode arrays were accomplished with a pacing circuit and added memory. The device was calibrated using various suspended particle samples and found to make accurate measurements. Author (GRA)

N85-25389# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
AFRPL (AIR FORCE ROCKET PROPULSION LABORATORY) TECHNICAL OBJECTIVE DOCUMENT FY 85 Technical Report, 1 Oct. 1985 - 30 Sep. 1986
R. L. Wiswell Dec. 1984 89 p
(AF Proj. 9991)
(AD-A151368; AFRPL-TR-84-101) Avail: NTIS HC A05/MF A01 CSCL 21/8

This report is a summary of technical objectives and approaches for research, exploratory development, and advanced development efforts being pursued, and to be pursued, at the Air Force Rocket Propulsion Lab. between FY 84-90. GRA

N85-25390# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN EXPERIMENTAL STUDY OF CLUSTERED, TWO-DIMENSIONAL ROCKET NOZZLES M.S. Thesis
D. R. Bjurstrom Dec. 1984 63 p
(AD-A151889; AFIT/GAE/AA/84D-1) Avail: NTIS HC A04/MF A01 CSCL 21/8

This thesis is about the construction and employment of hardware for investigating the pressure fields and flow phenomena in the base region of clustered nozzles during cold flow testing. Ambient test conditions simulating altitudes up to 75,000 feet and chamber to ambient pressure ratios up to 200 can be established. The clusters considered were made up of a pair of two-dimensional supersonic convergent divergent nozzles with a design exit Mach number of 3.68. Three nozzle sets were studied, each having different spacing between the nozzles. A Schilieren system that allowed for both still photographs and film was used to supplement the pressure data. This study indicates that the pressure fields in the base region of a nozzle cluster are heavily dependent on both geometry and on the operating altitude. The outer wall of the test section adjacent to the nozzles was observed to significantly affect the flow patterns and measured pressures. Potential influences on performance exist due both to changes in the gas dynamics of the flow and the appearance of additional pressure-area terms. GRA

N85-25391# Argonne National Lab., Ill. Components Technology Div.
FLOW INDUCED VIBRATION OF THE SSME LOX POSTS
S. S. Chen and J. A. Jendrzejczyk Sep. 1984 77 p refs Sponsored in part by NASA Lewis Research Center
(Contract W-31-109-eng-38)
(NASA-CR-175608; NAS 1.26:175608; DE85-994342; ANL-84-75) Avail: NTIS HC A05/MF A01 CSCL 21H

Cracking of liquid-oxygen (LOX) posts was observed in several evaluation tests. The design modification consists of attaching impingement shields to LOX posts in the upstream row. This improved the vibration/fatigue problem of LOX posts. However, that modification results in an increased pressure drop that ultimately affects the lifetime of other components. A preliminary assessment of the LOX post vibration problem is presented, as well as a review of relevant parameters, flow induced vibration mechanisms, scoping calculation and experiment, and a work plan for an integrated theoretical/experimental study. DOE

N85-25392# Los Alamos Scientific Lab., N. Mex.
LONG-TERM EXPOSURE OF PRESSED PLUTONIUM OXIDE HEAT SOURCES TO AQUATIC ENVIRONMENTS
R. C. Heaton, J. H. Patterson, S. T. Kosiewicz, G. M. Matlack, F. J. Steinkruger, G. E. Nelson, N. E. Vanderborgh, K. P. Coffelt, and B. Herrera Nov. 1984 16 p refs
(Contract W-7405-eng-36)
(DE85-007385; LA-10197-MS) Avail: NTIS HC A02/MF A01

Plutonium-238 oxide fuel pellets were exposed to water for 2.5 to 6.4 yr, and the concentration of plutonium in the water was monitored. Water composition and temperature were found to be important factors in determining the rate of plutonium release into the water. Typical release rates ranged from 10 to 40 ng/m(2)/s in cold fresh water and from 0.3 to 11 ng/m(2)/s in cold sea water. Release rates in sea water varied over time and sometimes were erratic. The plutonium release per unit area did not depend on the size of the PuO2 source. The released plutonium was in an extremely fine form, able to pass through 10,000 molecular weight cutoff filters. Apparent differences in the fuel pellet surfaces after exposure suggest that plutonium release is controlled by physical and chemical processes occurring at the solid-liquid interface. Release mechanisms and their implications are discussed. DOE

N85-25393# Societe Europeenne de Propulsion, Puteaux (France). Div. Propulsion a Liquides et Espace.
STUDIES ON ROCKET ENGINES FOR FUTURE EUROPEAN LAUNCHERS Final Report
Etienne and G. Schmidt Paris ESA 24 Jul. 1984 58 p refs Sponsored in part by ESA
(Contract ESA-5232/82)
(SEP-TPRL/K-19572/84; ESA-CR(P)-1982) Avail: NTIS HC A04/MF A01

A LOX-hydrocarbon engine for the propulsion of a reusable launcher first stage was defined and commonality with the HM60 was analyzed. Engines presented are: LOX-CH4, LOX-C3H8, LOX-UDMH, and LOX-RP1. Engine performances and cooling analysis are summarized. Results suggest that the LOX-methane combination is the most promising. Author (ESA)

N85-25614# Joint Publications Research Service, Arlington, Va.
SEP OF FRANCE TO MAKE ARIANE HM-60 CRYOGENIC ENGINE
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-027) 17 Aug. 1984 p 12-15 Transl. into ENGLISH from AFP Sci. (Paris), 12 Jul. 1984 p 14-17 (For primary document see N85-25612 15-31)
Avail: NTIS HC A04/MF A01

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N85-25394# Duke Univ., Durham, N. C.
ABSTRACTS OF THE 36TH SOUTHEASTERN REGIONAL MEETING OF THE AMERICAN CHEMICAL SOCIETY Final Report
M. E. Hobbs Oct. 1984 201 p Meeting held at Raleigh, N. C., 24-26 Oct. 1984
(Contract DAAG29-84-M-0397)
(AD-A151506; ARO-21854.1-CH-CF) Avail: NTIS HC A10/MF A01 CSCL 07/4

This report provides the program and abstracts of papers for the 36th Southeastern Regional Meeting of the American Chemical Society held October 24-26, 1984. Topics covered include: Organic chemistry, Toxicology, Chromatography, Polymers, Computer programs, Catalysis, Synthesis, Analytical chemistry, Inorganic chemistry, Biochemistry, Environmental chemistry, Education, Physical chemistry, and Medicinal chemistry. GRA

N85-25395# Joint Publications Research Service, Arlington, Va.
USSR REPORT: MATERIALS SCIENCE AND METALLURGY
20 Mar. 1985 87 p Transl. into ENGLISH from various Russian articles
(JPRS-UMS-85-001) Avail: NTIS HC A05/MF A01

Various topics addressing the mechanical, structural, and thermal properties of metals and nonmetallic materials are discussed. General subject areas include: amorphous alloys, coatings, composite materials, effects of radiation on metals, glass and ceramics, power metallurgy, and welding. For individual titles, see N85-25396 through N85-25432.

N85-25396# Joint Publications Research Service, Arlington, Va.
EFFECT OF DEEP COOLING ON CRACK RESISTANCE AND LOW-TEMPERATURE HARDENING OF ALUMINUM ALLOYS Abstract Only **c26**
G. S. Pisarenko, V. A. Strizhalo, O. Ya. Znachkovskiy, and L. S. Novogrudskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 1 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 11, Nov. 1984 p 27-32 Original language document was announced in IAA as A85-16906 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

The deformation and fracture behavior of structural Al-Mg (AMg5 and AMg6) and Al-Mn (AMtsS) alloys has been investigated in the temperature range 293 to 4.2 K. The strength of the alloys studied is shown to increase significantly at cryogenic temperatures. The ductility and the fracture toughness of the alloys also increase in the temperature range 293 to 77 K but then decrease as the temperature decreases further to 4.2 K. V.L. (IAA)

N85-25397# Joint Publications Research Service, Arlington, Va.
FATIGUE OF CLAD ALUMINUM MATERIALS D16T AND 2024-T3 WITH STEPPED LOADING Abstract Only **c26**
M. Iustern, Mambve, and A. I. Radchenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 2 Transl. into ENGLISH from Fiz.-Khim. Mekhan. Mater. (Kiev), v. 20, no. 6, Nov. - Dec. 1984 p 87-88 Original language document was announced in IAA as A85-24044 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Test results for clad aluminum materials, D16T and 2024-T3, are shown to confirm the validity of a discrete probabilistic model of fatigue fracture for various stressed states. It is also shown that the fatigue life of aluminum-base alloys under cyclic loading can be calculated by using the universal fracture constant determined in an earlier study (Ivanova and Terentev, 1975) for pure metals. V.L. (IAA)

N85-25398# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF SYMMETRY OF IMMEDIATE SURROUNDINGS IN AMORPHOUS Co-P ALLOYS Abstract Only **c26**
R. S. Ishakov, G. I. Fish, V. K. Maltsev, and R. G. Khebopros *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 3 Transl. into ENGLISH from Fiz. Met. i Metalloved. (USSR), v. 58, no. 6, Dec. 1984 p 1214-1215 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

The close order symmetry of amorphous Co-based alloys were determined by nuclear magnetic resonance (NMR) in studies of concentration variation of NMR spectrum chracteristics. The objects of the study are Co-P alloys obtained by chemical precipitation, containing from 1 to 14 at.%P. As the concentration of phosphorus decreases, the frequency corresponding to the spectral maximum approaches 227 MHz, the NMR frequency of crystalline hexagonal close-packed Co. At about 5 at.% there is a sharp change in the variation of frequency and 2 (delta) f related to a change in symmetry of the crystalline solid solution. At greater concentrations, over 6 at.%, the experimental points for maximum frequency fall on a straight line. Extrapolation of the line to the ordinate yields a value of 214 + or - MHz for maximum frequency. The frequency of 216 MHz for face-centered cubic crystalline Co falls within the confidence interval of the initial ordinate of the line. The lack of anomalies in concentration variation of maximum frequency on 2 (delta) f at voer 9 at.% indicates that the close order symmetry does not change upon concentration transition of the crystalline solid solution to an amorphous state. Thus, amorphous Co-P alloys have face-centered cubic near-order symmetry. Author

N85-25399# Joint Publications Research Service, Arlington, Va.
TEMPERATURE VARIATION OF RESISTIVITY OF CERTAIN ALLOYS BASED ON TRANSITION AND SIMPLE METALS IN AMORPHOUS AND CRYSTALLINE STATES Abstract Only **c26**
S. G. Gurnbatov, G. Kh. Panova, and A. A. Shikov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 5 Transl. into ENGLISH from Fiz. Met. i Metalloved. (USSR), v. 58, no. 2, Aug. 1984 p 292-297 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

The temperature variation of resistivity of the amorphous systems Zr(70)Be(30), Zr(60)Be(40), Hf(58)Be(42), Zr(75)Rh(25), Zr(54)Cu(46), Mg(70)Zn(30) and their crystalline analogs in the 4.2 to 300 K temperature range was studied. All of the systems have a single phase in the Metastable crystalline states, with second phase content of Zr(54)Cu(46) not over about 4%. Resistance behaves anomalously in amorphous specimens, dropping by 4 to 6% with an increase in temperature from 4.2 to 300 K. The temperature variation of the specimens can be described within the framework of the theory of liquid metals, in which the temperature variation of the structural factor explains the existence of a negative temperature coefficient of resistance. The crystalline analogs of the amorphous systems have the traditional positive variation of coefficient of resistance. Author

N85-25400# Joint Publications Research Service, Arlington, Va.
CONVERSIONS IN AMORPHOUS ZIRCONIUM-VANADIUM ALLOY Abstract Only **c26**
Yu. V. Barmin, V. V. Vavilov, L. N. Galkin, I. V. Zolotukhin, Yu. K. Kovneristyy, and G. I. Ruda *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 6 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 278, no. 2, Sep. 1984 p 348-350 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Amorphous V-Zr alloys were produced by spraying methods. Quenching from a gaseous phase was performed in order to study phase conversions and thermal durability. Very thin foil was prepared at 293 K, producing evenly distributed components which were then studied by X-ray, electron diffraction and differential thermal analysis. The diffractogram showed a single diffusion halo from the sample. The attempt to produce an amorphous foil alloy

failed, since a polycrystal of metastable finely dispersed phase grains of 3.0 nm size emerged. Thermal analysis after gradual heating to 1123 K revealed exothermal effects at 848, 888, 948 and 993 K. These changes were attributed to changes in topological structure that approached the desired amorphous structure. Retaining the sample at 573 K for 1 hour after gradual heating reduced all conversion temperatures, while heating to 1123 K, brought crystallization and emission of V2Zr and alpha-Zr. Bonding began to weaken above 723 K and internal friction changes above 593 K. The alloy had 49.3% Zr by weight. Author

N85-25401# Joint Publications Research Service, Arlington, Va.
STRUCTURE AND AGING OF AMORPHOUS CHROMIUM-GERMANIUM ALLOYS Abstract Only c26
Yu. I. Maslennikov and N. P. Sudakova *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 6-7 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Neorgan. Mater. (Moscow), v. 20, no. 11 p 1834-1838 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

The radial distribution of atoms g(r) = rho(r)/rho in Cr-Ge alloys was established experimentally, on the basis of the structural factor alpha (s) = i(s) + 1, with the aid of Fourier transformations. Model functions of this distribution were subsequently constructed on the basis of simple b.c.c. and c.p.h. lattices with a packing factor ETA = 0.64 and a density corresponding to that of the amorphous phase. Structural factors were then calculated according to the discrete Debye equation, after redistribution of atoms over coordination spheres, whereupon the results were compared with measurements. Amorphous films of chromium germanides (Cr3Ge, Cr3Ge2, CrGe) were prepared by thermal sputtering of presynthesized alloys. The amorphous Cr3Ge compound was found to have a structure characterized by an irregular close packing of different atoms. The initially quasi-crystalline disordered b.c.c. structure with a short-range order and of the substitutional kind transformed, upon annealing into an ordered superstructure of the intermetallic compounds with a BETA-W (A-15) lattice. The other two intermetallic compounds were found to have microheterogenous structures, but without ordering of friable germanium. Author

N85-25402# Joint Publications Research Service, Arlington, Va.
STUDY OF AMORPHOUS STRIPS AND MICROCONDUCTORS BY FERROMAGNETIC RESONANCE METHOD Abstract Only c26
V. S. Pokatilov, S. V. Kapelnitskiy, V. P. Ovcharov, B. N. Kulagin, and L. K. Zakharova *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 7-8 Transl. into ENGLISH from Fiz. Met. i Metalloved. (USSR), v. 58, no. 6, Dec. 1984 p 1144-1147 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

The ferromagnetic resonance method was used to study amorphous ferromagnetic alloys based on Fe, Co and Ni. The saturation magnetization and g-factor were computed for strip specimens from data on the resonant field with perpendicular and parallel placement of the plane of the specimen relative to a consant external magnetic field. The reasons for differences between strip and wire specimen values of delta H are studied. The heterogeneity of the effective field arises due to macroscopic heterogeneity of the demagnetizing fields in the strip. The structure of the amorphous strip is essentially heterogeneous. The inversely proportional variation in ferromagnetic resonance line width as a function of magnetization and the values of relaxation parameter for amorphous alloys are similar to those observed earlier for perfect ferromagnetic single crystals. E.A.K.

N85-25403# Joint Publications Research Service, Arlington, Va.
OUTLOOK FOR POLYMER COMPOSITE MATERIALS Abstract Only c27
Yuriy Sergeyevich Lipatov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Apr. 1985 p 12-16 Transl. into ENGLISH from Krasnaya Zvezda (Moscow), 8 Dec. 1984 p 3-4 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

The development of new materials with specified properties, known as polymer composites is discussed. Polymer composite properties and their structure and the future development of polymer material research is examined. The potentials for polymer materials in computer and information sciences, construction materials, machine building, and as reinforcing materials are outlined. E.A.K.

N85-25404# Joint Publications Research Service, Arlington, Va.
RESEARCH, DEVELOPMENT OF COMPOSITE MATERIALS DESCRIBED Abstract Only c24
A. Sviridenok *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 17-19 Transl. into ENGLISH from Sov. Belorus. (Minsk), 27 Nov. 1984 p 3 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Composite materials based on polymers were discussed. The need for structural efficient materials with higher strength and wear resistance, stability under the influence of high and low temperatures, radiation, gaseous and liquid environments is outlined. Materials to cover glass pipes with polymer coatings, which reinforce, protect, and insulate were developed. The use of liquid crystal and magnetic sensitive systems as additives to hard and liquid composite materials is emphasized. E.A.K.

N85-25405# Joint Publications Research Service, Arlington, Va.
LOCAL ELASTOPLASTIC FRACTURE OF FIBROUS COMPOSITE MATERIALS Abstract Only c24
L. T. Berezhnitskiy and N. M. Kundrat *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1984 p 20 Transl. into ENGLISH from Fiz.-Khim. Mekhan. Mater. (Kiev), v. 20, no. 5, Sep. - Oct. 1984 p 57-64 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

A mathematical model of fiber-reinforced composite materials was constructed for analysis of local elastoplastic fracture. The corresponding plane problem is formulated in a Cartesian system of coordinates and is solved for an infinitely large isotropic plate containing two collinear fibers of equal length. The material of the binder and the contact layers is assumed to be ideally elastoplastic and uniformly strong, satisfying the Trask-St. Venant condition. The plate is under uniaxial tension in the direction of the fibers. The solution to the equations according to elasticity theory yields the dependence of the lengths of slip bands on the applied force, on strength and elastic properties of the composite, and on interaction of the fibers. The limiting case of a very narrow gap between the fibers corresponds to the condition of fiber rupture. It is indicated that the critical fiber length increases and the critical load decreases for a binder material with lower shear modulus, a contact layer with lower shear strength, and smaller maximum allowable displacement discontinuities. For a binder material with smaller Poisson ratio the critical fiber length and the critical peeling load increases. E.A.K.

N85-25406# Joint Publications Research Service, Arlington, Va.
POWDER METALLURGY PRODUCTION PROBLEMS Abstract Only c26
S. Kiparisov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 27-29 Transl. into ENGLISH from Izv. (Moscow), 15 Jan. 1985 p 2 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Powder metallurgy holds a special place among the various metal processing methods. The methods enable the manufacturing of many types of products, and a significant saving of metal and manpower. Powder metallurgy provides materials, without which scientific technical progress would be inconceivable. Much was done to develop an experimental base, and to organize the manufacturing of different powders and products made from them. However, these are considered as only the first steps. The production of iron powders, which are the basis of the new direction in metallurgy, so far is 38% lower than the target figure, and the production of copper based powders is 44% lower. E.A.K.

N85-25407# Joint Publications Research Service, Arlington, Va.
FATIGUE STRENGTH OF ALPHA-TITANIUM ALLOYS UNDER COPHASAL ACTION OF VARIABLE NORMAL AND TANGENTIAL STRESSES Abstract Only **c26**
Yu. A. Shamanin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 38 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 12, Dec. 1984 p 26-27 Original language document was announced in IAA as A85-19980 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Smooth specimens (30 mm in diameter) cf the alpha titanium alloy PT-3V have been fatigued under simultaneous loading by normal and tangential stresses. The experimental data are found to be in good agreement with the maximum tangential stress criterion; microscopic cracks propagate at the sites of maximum tangential stress. It is concluded that Cough's (1935) criterion can be used for estimating the fatigue strength of alpha titanium alloys under plane stressed state. V.L. (IAA)

N85-25408# Joint Publications Research Service, Arlington, Va.
STUDY OF STRUCTURAL CHANGES OF DUAL-PHASE TITANIUM ALLOY DURING SHOCK WAVE LOADING Abstract Only **c26**
Yu. N. Petrov, G. N. Nadezhdin, V. L. Svechnikov, and V. V. Astanin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 39 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 12, Dec. 1984 p 29-33 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Recent research has frequently included study of changes in materials after shock wave loading, which is suggested as a modification of dislocation models of high-speed deformation processes. However, little information on such methods as they relate to titanium and its alloys has been published. A study of changes in alpha- and beta-phases of titanium in a dual-phase industrial alloy, VT8 is discussed. The shock wave load rates tested were 60 and 600 m/sec. After the procedure, results were assessed by electron microscope. The VT8 alloy had a globular structure, with platelet forms appearing after heating past the alpha beta transformation point. Results showed that the original structural laminates broke down under the shock wave, with extensive slip and twinning through all alpha-platelets. Twinning was greater at 600 m/sec than at 60 m/sec, with formation of numerous unstable defects on specific alpha-planes of crystals and hydrides in the beta-phase at 600 m/sec. No omega-phase formations were noted after the shock wave loading. Author

N85-25409# Joint Publications Research Service, Arlington, Va.
POSSIBLE USE OF RAPID HEATING FOR IMPROVING MECHANICAL PROPERTIES OF TITANIUM ALLOYS Abstract Only **c26**
L. A. Yelagina, A. I. Gordiyenko, M. Ya. Brun, and V. V. Ivashko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 39-40 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Met. (Moscow), no. 12, Dec. 1984 p 32-36 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Use of rapid heating prior to deformation shaping and in thermal processing of titanium semimanufactured products promises increased production efficiency, but titanium alloys tend to become brittle under such treatment if they show high activity with oxygen, nitrogen or hydrogen. A process to improve heat durability and viscosity of rolled rods with globular granular structure through use of rapid annealing of plate-like granules of less than 300 micron size is discussed. A beta-annealing process was used on VT9 and VT18 rods with granules of 5, 50, 100, 200, 500 and 900 micron dimensions. Results showed that with sizes of 50-200 microns, rapid electric heating to 1050-2000 C brought significant improvement in heat durability. Pulverization of the alloy and subsequent homogenization was proceded by minor alpha+beta deformation. Rapid heating can also be used for pulverization, without deformation. Heating can also be used to promote heterogenity of structure, which resulted in the tests in improved crack resistance and other mechanical advantages in the alloy. Author

N85-25410# Joint Publications Research Service, Arlington, Va.
EFFECT OF ANNEALING PROCEDURES ON STRUCTURE AND PROPERTIES OF VT6 ALLOY WITH INITIAL LARGE-GRAINED STRUCTURE Abstract Only **c26**
L. S. Krasnoyartseva, V. S. Lyasotskaya, and O. A. Mozolevskaya *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 40 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Met. (Moscow), no. 12, Dec. 1984 p 36-39 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Large semimanufactured parts of titanium alloys typically have structure of large granules and reduced mechanical properties, especially plasticity. A study of VT6 alloy (with 5.8% Al, 3.8% V, 0.07% Fe, 0.04% Si, 0.02% C, 0.14% O, 0.01% N and 0.002% H) annealed at 1050 C for 2 hours, then cooled was conducted. Other samples were annealed at temperatures from 800 to 1050 C for 1 to 5 hours before cooling. With all samples, cooling was either by normal air or gradually to a temperature such as 450 C before regular air cooling. Results showed some decline in granular size after cooling from 800-900 C in air, as the original alpha-phase resolidified after partial melting. At 1000 and 1050 C, thin platelet granules formed with air cooling and thicker ones with oven cooling. Water immersion gave the same results. Plasticity was higher and durability lower for over cooled samples. The greatest structural changes were noted after annealing at 900-980 C and air cooling, with formation of thin alpha-phase plates that reduce plasticity. Best plasticity came when alloys were oven-cooled gradually to 450 C before exposure to air. Author

N85-25411# Joint Publications Research Service, Arlington, Va.
EFFECT OF ALUMINUM ON NATURE OF TITANIUM ALLOY FAILURE Abstract Only **c26**
A. A. Popov and L. I. Anisimova *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 41 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Met. (Moscow), no. 12, Dec. 1984 p 40-43 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Use of high-durability titanium alloys is limited by their poor ability to absorb shock after tempering. Failure cracks usually develop in the viscosity system with pitting. A study of the effects of chemical composition and thermal processing procedures on the nature of failure of beta- and (alpha+beta) structures in such alloys is discussed. Industrial and semi-industrial VT9, VT8, VT3-1, VT22, VT15 and VT30 alloys, which vary in content of T, Al, Mo, Zr, Cr, V and Sn, were heated to 1100 C dropping to 800 C for 2 hours, then tempered or air-cooled. Plastic deformation was less in VT22 than in VT15, of which the former contained more aluminum. The weakest link was between alpha and beta granules, and pit sizes corresponded closely to granule size. Further testing showed that aluminum adsorbed on interphase and intergranule boundaries, thereby weakening them and contributing to cracking of the tested alloys. The distribution of aluminum atoms in a given alloy thus is a crucial factor in determining uses of and subjecting these alloys to thermal processing. Author

N85-25412# Joint Publications Research Service, Arlington, Va.
STUDY OF OXIDIZED SURFACE COATING ON TITANIUM AFTER ANNEALING Abstract Only **c26**
V. V. Peshkov and V. N. Milyutin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 41-42 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Met. (Moscow), no. 12, Dec. 1984 p 43-45 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Titanium is generally processed in rarified air due to its tendency to absorb large amounts of oxygen that form oxide coatings on the metal. Use of a special (Raster) electron microscopy (REM) to study titanium-oxygen reactions during annealing at various temperatures from 500 to 900 C is reviewed. Samples of VT1-0

were heated for 1 hour at 0.4-10 Pa pressure, and also annealed under autovacuum conditions. Samples were then cut to 2.5 mm and subjected to a force that caused cracking. Results showed that an oxide coating began forming at 500 C; at 650-700 C the oxide crystals took on globular shape with 0.05 to 0.2 micron diameter at annealing temperatures of 0.4 and 10 Pa, respectively. After autovacuuming the samples had a glittering metallic surface which showed only titanium lines on electronograms. Temperature and air pressure were shown to be factors in both thickness and structure of the oxides formed. With thin oxides (up to 10 microns), cracking took place without formation of facets, while with thicker coatings produced by greater heat, scale facets appeared which, however, decreased in size as oxide thickness increased. The autovacuum procedure prevented oxidation and oxygen saturation. Author

N85-25413# Joint Publications Research Service, Arlington, Va.
RESISTANCE OF HYDROGENATED ALPHA-TITANIUM ALLOYS TO CORROSION-FATIGUE FRACTURE Abstract Only c26
V. I. Syshchikov, P. Ya. Sidor, Yu. I. Babey, G. I. Ivanyukhina, and M. D. Klakiv *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 43 Transl. into ENGLISH from Fiz.-Khim. Mekhan. Mater. (Kiev), v. 20, no. 5, Sep. - Oct. 1984 p 117-118 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

The effect of hydrogenation on the corrosion-fatigue resistance of the PT-7M alpha-titanium alloy and the attendant hydrogen embrittlement were studied experimentally in an aqueous 3% NaCl solution at two low temperatures (273K, 363K), and in an aqueous 10% NaCl + 5% MgCl2 solution at a high temperature (513K). Blank specimens 100 mm long were cut from rods 16 mm in diameter, whereupon 55-60 X-form incisions leaving a neck 1.5-1.6 mm in diameter were at the center of each for subsequent welding with 1.6 mm rods of the same material. After welding, the blanks were degassed and then hydrogenated, some to 0.02% H2 and others to 0.03-0.35% H2, whereupon they were machined down to a diameter of 4 mm. Smooth segments, segments with sharp annular notch, and segments with a welding seam were tested for fatigue in pure flexure at the three temperatures, in the corresponding salt baths under a hydrostatic pressure of 3-4 MPa. The results indicate that 3% NaCl has no effect on the 300 MPa fatigue strength of smooth rods at 293K and 363K, but that salt lowers it by by 10% at 513K. A sharp annular notch reduces the fatigue strength to 60-70 MPa in salt or in air. The fatigue strength of welding seams increases upon hydrogenation to 0.02% H2, but further hydrogenation again lowers it. Author

N85-25414# Joint Publications Research Service, Arlington, Va.
HYDROGEN RESISTANCE OF VT1-0 TITANIUM UNDER 150 MPa PRESSURE AT ROOM TEMPERATURE Abstract Only c26
Yu. I. Archakov, T. D. Aleferenko, and Yu. V. Telegin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 43-44 Transl. into ENGLISH from Fiz.-Khim. Mekhan. Mater. (Kiev), v. 20, no. 5, Sep. - Oct. 1984 p 118-119 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

An experimental study was made for the purpose of determining the effect of high-pressure hydrogen at room temperature on the mechanical properties of VT1-0 titanium. After soaking in 99.8% pure H2(0.1% 02 + 0.1%N2) under pressure, the specimens were tested mechanically. The effect on stresses, particularly tangential tensile ones, was measured on tubular specimens of various thicknesses cut from rods with an original 0.0022 wt.% H2 content. These specimens were held for 500 h under internal pressures up to 150 MPa matching the wall thickness. After being held for 2000 h under an external pressure of 150 MPa, 15 mm-long rod specimens 3 mm in diameter with an original 0.0049 wt.% H2 content were tested for tensile strength in an R-5 machine with 2 mm/min displacement and 6 mm-thick strip specimens with an original 0.0015 wt.% H2 content were tested for impact strength with an MK-30 pendulum. After these tests a microstructural examination of specimens was made, and their hydrogen content was measured by the method of melting in a stream of a carrier gas. The results indicate no change in mechanical properties and in microstructure after exposure to hydrogen under high pressure at room temperature. Author

N85-25415# Joint Publications Research Service, Arlington, Va.
STRUCTURAL CHANGES WITH ONE- AND TWO-STAGE AGING OF ALLOYS Ti-Al-Mo-Fe AND Ti-Zr-V-Al-Sn Abstract Only c26
V. B. Vasilyeva and M. I. Zakharova *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 44 Transl. into ENGLISH from Fiz. Met. i Metalloved. (USSR), v. 58, no. 6, Dec. 1984 p 1188-1193 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

The purpose of this work was to study the influence of one- and two-stage aging on structural transformations in alloys of the compositions 78Ti-14Al-4Mo-4Fe and 75.5Ti-7Zr-12V-4Al-1.5Sn, with two-phase (beta+alpha') martensite structure after hardening. The alloys were produced in an arc furnace in an atmosphere of purified argon with 6-times remelting from high-purity metals. Homogenization at 1100 C, hardening in oil and tempering at all temperatures was performed in a vacuum of 10-3 Pa. The alloys were studied by X-ray analysis of polycrystals, electron and optical microscopy and by measurement of microhardness. Two-stage aging leads to higher values of microhardness than one-stage aging if the high-temperature aging stage is begun after segregation of most of the crystals but before the beginning of coagulation. Author

N85-25416# Joint Publications Research Service, Arlington, Va.
DIFFUSION VACUUM WELDING Abstract Only c37
V. Volodin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 45-50 Transl. into ENGLISH from Znaniye-Sila (Moscow), no. 11, Nov. 1984 p 17-18 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

A vague history of diffusion welding is presented. Little attention is paid to specific details of either the vacuum processes or the materials bonded. G.L.C.

N85-25417# Joint Publications Research Service, Arlington, Va.
WAYS OF IMPROVING LEVEL AND STABILITY OF MECHANICAL CHARACTERISTICS OF DIFFUSION-WELDED JOINTS OF OT4 TITANIUM ALLOY Abstract Only c37
V. V. Peshkov and V. N. Rodionov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 53 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 11, Nov. 1984 p 39-43 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Improving and increasing mechanical characteristics of diffusion-welded joints is imperative because of current variations in mechanical properties attributed in part to microstructural irregularities. The present article reports on a new theoretical approach to resolving these problems and its experimental verification using the common OT4 titanium alloy. Various shapes tested showed that globularly structured alloys had the least resistance to deformation, and plate-like structures with clear boundaries of the original beta-granules had the most resistance. Factors of creep during welding, physical contact and surface activation, and chemical bonds are discussed. Recrystallization was found in alloys with even axial structures and those with prominent alpha-granules. The quality of joints with any given welding procedure was closely tied to the initial microstructure, with the weakest part of the joint found between different structural types. B.W.

N85-25418# Joint Publications Research Service, Arlington, Va.
RESIDUAL OXYGEN PRESSURE IN CONTACT GAP UPON DIFFUSION WELDING OF TITANIUM Abstract Only c37
V. V. Peshkov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 53 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 11, Nov. 1984 p 6-7 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Productioon of a quantitative estimate of the gas pressure in the contact gap during diffusion welding of titanium as a fuction of technological parameters is an important problem, since it allows a judgment to be made concerning the mechanism of cleansing of the welded surfaces of scale and an estimate of the degree of rarefaction of air in the vacuum chamber. This problem is solved in this article by analysis of a model of the contact zone and description of processes occurring in it during diffusion welding. The mathematical model used produces an equation which can be used to estimate the concentration of gas in the contact gap and analyze the influence of temperature, gap width and oxygen partial pressure in the welding chamber on depth of penetration of oxygen into the contact zone. Author

N85-25419# Joint Publications Research Service, Arlington, Va.
BRITTLE FRACTURE RESISTANCE OF ELECTRON BEAM-WELDED JOINTS IN TITANIUM ALPHA ALLOYS Abstract Only **c37**
F. G. Gonserovskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 54 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 12, Dec. 1984 p 4-5 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

In spite of high impact toughness, certain high-strength titanium alpha alloys have a tendency toward brittle fracture under normal operating conditions and static loads. Alloys types VT5, AT6, TS5 and VT20 were electron beam welded, 18 mm of thickness per pass following abrasive disk cleaning and degreasing with acetone. Specimens were annealed at 750 to 880 C for one hour and notched in the root portion of the seam by an electric erosion method with a brass wire 0.2 mm in diameter. The hardness and impact toughness were measured in various sections of the joint. The brittle fracture resistance was found to decrease, the transition temperature of the seam metal from the brittle to the tough state to increase in static bending tests. Annealing for relief of residual stresses increased the crack development resistance in VT5 alloy, decreasing it in TS5 and VT20. Static bend testing is found to be a more rigid test for these alloys than ordinary impact bending. Author

N85-25420# Joint Publications Research Service, Arlington, Va.
INCREASING SEAM FORMATION STABILITY IN ELECTRON BEAM WELDING OF VERY THICK TITANIUM ALLOYS Abstract Only **c37**
N. A. Olshanskiy, A. P. Lopatko, and N. P. Tolokonnikov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 54-55 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 12, Dec. 1984 p 1-2 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

In electron beam welding of thick titanium alloy structures by a horizontal beam, metal flows from the channel, forming cavities and discontinuities sometimes reaching one-third the volume of the melted channel. These defects can be eliminated by observing proper welding conditions, based on analysis of the seam formation mechanism. This article presents a mathematical study of the mechanism, representing the welding bath as a fluid moving in a cylindrical channel open on both sides and acted upon by internal pressure equal to the sum of the vapor pressure and hydrostatic pressure. The forces of surface tension acting on the drop flowing out of the channel must retain the fluid. The mathematical fluid model of the process suggested allows the possibility of stable and defect-free formation of the seam to be computed, depending on the position of the beam focus, slope angle of the melting channel, vapor pressure gradient and thermophysical properties of the metal. Author

N85-25421# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF COATING FOR PROTECTION OF BACK-SIDE OF SEAM IN WELDING OF TITANIUM ALLOYS Abstract Only **c37**
B. Yu. Mozeyko, V. V. Bazhenov, and I. Ya. Degytarev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 55 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 12, Dec. 1984 p 22-24 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Results are presented from studies intended to increase the reliability of protection of the backside of a seam during welding of titanium alloys outside of a controlled atmosphere chamber by creation of a strong protective coating. Experiments were performed on sheets of VT20 alloy 2 mm thick. The coating was made from oxygen-free halides, specifically alkali and alkali earth metal fluoride-chloride mixtures which had been heated for 2 hours to 523 K. The composition of the coating charge was 12% CaCl2, 4% NaF, remainder CaF2. The charge was mixed with a volatile acetone plus ethanol mixture to produce a paste which was easy to apply. Thermodynamic calculations indicate that the most probable reaction between coating and base metal is the reaction between aluminum and sodium fluoride, which becomes possible at 1850 K. Due to the low activity of the aluminum in the alloy, the yield of this reaction is slight, so that it does not influence the final content in the alloy. This yield is confirmed by direct elemental microanalysis of the seam metal. B.W.

N85-25422# Joint Publications Research Service, Arlington, Va.
STRUCTURE AND MECHANICAL PROPERTIES OF DISPERSION-HARDENED NICKEL ALLOY JOINTS WELDED BY DIFFUSION Abstract Only **c37**
E. S. Karakozov, A. P. Ternovskiy, T. S. Samsonova, E. V. Davidyan, and B. N. Babich *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 56 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 11, Nov. 1984 p 15-17 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

A study is made of the influence of the major parameters of welding on accumulated deformation and kinetics of formation of physical contact in diffusion welding of the dispersion hardened nickel alloy VDU-2. The kinetics of growth of relative strength and relative elongation of joints welded at 780, 820, 860 and 900 C with compressive forces of 65, 70, 75 and 80 MPa were determined. With increasing welding time the dimensions of defects in the welded zone decreased signficantly, practically disappearing at 30 minutes. The recommended temperature for the process is 860-900 C with loading applied over a period of at least 15 minutes. Author

N85-25423# Joint Publications Research Service, Arlington, Va.
STUDY OF EXPERIMENTAL ROBOTIZED SYSTEM FOR ARC WELDING BASED ON UNIVERSAL-15 MANIPULATOR Abstract Only **c37**
V. A. Timchenko, A. I. Bondarenko, S. V. Dubovetskiy, V. N. Skorina, A. Yu. Kargashin, and V. E. Bulatov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 56 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 11, Nov. 1984 p 33-38 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

A robotized arc welding system that features the Universal-15 manipulator with six types of motion, including two directional and four rotational functions is described. For welding purposes maximum movement speeds have been reduced by a factor of 4 in the Universal-15. Programming and program implementation have concentrated on selecting position for stock and arc, preparing the robot to follow given welding procedures, and monitoring and correcting motion of the welding torch. Experimental operation has shown that the greatest variations from specifications were brought on by instability of clearance, resulting in seam irregularity, and excessive tolerances in electrode diameter. Author

N85-25424# Joint Publications Research Service, Arlington, Va.
DYNAMIC CHARACTERISTICS OF ac ARC IN WELDING ALUMINUM ALLOYS Abstract Only **c37**
G. M. Korotkova *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 57 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 11, Nov. 1984 p 30-32 (For primary document see N85-25395 15-23)

Avail: NTIS HC A05/MF A01

Increasing the stability of second arc activation during welding of aluminum alloys with alternating current through a non-melting electrode involves a number of static and dynamic factors which are the subject of the present article. Tests were made of AMg6 alloy, welded in a current range of 60-400 amperes in an argon medium. Resistance was 0.02-0.16 ohms in the negative, and 0.03-0.26 ohms in the positive segment of the current; with change in polarity, these values were 0.2-1.11 ohms in the negative and 0.58-1.8 ohms in the positive segment. Special stabilizers were used to regulate the arc. Consistent secondary activation depends on the duration of transitional processes, with the least values for sinusoidal current being reached at above 70 amperes; below that, stabilizer function was too limited to maintain secondary arc activation. Author

N85-25425# Joint Publications Research Service, Arlington, Va.
EVALUATION OF STRESS CONCENTRATION COEFFICIENTS IN BUTT-WELDED JOINTS WITH DISPLACED EDGES Abstract Only c39
M. V. Shakhmatov, I. A. Vorobyev, and S. V. Bogoslovskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 58 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 12, Dec. 1984 p 11-13 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Edge displacement in welding is a very common defect that causes excessive concentration in joints and, consequently, early failure. The present article reports on an evaluation of stress concentration coefficients in such welded joints in relation to their geometric parameters, such as deviation from the transitional radius from seam to basic metal and seam width. A finite element method was used to simplify calculations of stress in various welded joints in order to consider interrelations between basic geometric parameters. Results showed that with small values for the transitional radius from seam to basic metal (< 0.6) and with displacement greater than 0.2, stress concentrations can reach significant levels. Seam width was not an important factor. Experimental results coincided with calculations of the stress concentration coefficients. Author

N85-25426# Joint Publications Research Service, Arlington, Va.
PRESSURE WELDING OF CORROSION-RESISTANT STEEL WITH AMg6 ALUMINUM Abstract Only c37
V. D. Saprygin, V. I. Sokolov, Ye. V. Onosovskiy, E. S. Karakozov, and V. I. Zotin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 58 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 12, Dec. 1984 p 10-12 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

A technology was developed for manufacturing aluminum plus steel (AMg6+12Kh18M10T) pipe junctions by heat and pressure welding. The heated parts are brought together with significant force with a wire of a softer material between them. The quality of the welded joints produced was estimated by testing of specimens loaded in extension until separation occurred. Separation occurred at the softer AMts insert material. The most important parameters in the welding method are the cone angle of the contacting end surface on the aluminum alloy 5 deg, circular projections with a tip angle of 60 deg, height 0.75 mm, and spacing 1.0 mm on the end surface of the steel parts; temperature 673 K, degree of formation of intermediate softer insert 70 to 80%; and pressure 600-650 MPa. Residual stresses and relaxation processes influence the formation of the welded joint. The specimens are satisfactory for production of cryogenic equipment. Author

N85-25427# Joint Publications Research Service, Arlington, Va.
EFFECTIVENESS OF USE OF HEAT-DISSIPATING CLAMPS TO REDUCE DEFORMATION DURING ARGON ARC WELDING OF THIN SHEETS OF AMg6 ALLOY Abstract Only c37
I. M. Zhdanov, B. V. Medko, V. V. Lysak, V. N. Nifantov, and S. L. Dykhno *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 59 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 12, Dec. 1984 p 43-45 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Heat and force interactions generally cause deformations during welding of thin AMg6 alloy sheets. Transverse contraction when heat-dissipating clamps are used to control sheet position was studied using deformations with 25, 50 and 100 mm bases, at various times during welding. Results show that contraction begins during initial heating, long before the heat source approaches the weld site, and reaches its maximum after the arc focus passes the weld site. Contraction could be reduced by using highly concentrated energy sources, as well as by use of heat-dissipating equipment such as the clamps tested. It was possible to reduce shrinkage below that found in microplasma welding and close to that in laser and electron arc processes. Copper clamps provided the best heat dissipation. The clamps were most effective when located very close to the weld site. Author

N85-25428# Joint Publications Research Service, Arlington, Va.
DURABILITY OF JOINTS OF 30KhGSA AND 12Kh18N10T STEELS MADE BY DIFFUSION WELDING Abstract Only c39
N. F. Kazakov, V. A. Trifonov, V. V. Nikolayenko, V. Yu. Varyanitsa, and N. V. Yermakov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 59-60 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 12, Dec. 1984 p 46-49 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Welded 30KhGSA and 12Kh18N10T steels and the nature weld failures are considered. The test welding was done at 1470 K at a rate of 20 minutes/meter and pressure of 10 MPa. Results show that at the 1470 K temperature, considerable metal creep was encountered, but a durable seam was obtained. Later failure occurred in the 12Kh18N10T steel with classic cone-cup form. Metallography shows the presence of a transitional zone where the metal had less etching and greater microhardness. This zone was formed by decarbonization of the 30KhGSA steel and penetration of chromium, titanium and nickel into the zone. The transitional zone, with a width of 10-15 microns, assured a durable joint of the test steels. Author

N85-25429# Joint Publications Research Service, Arlington, Va.
CONTACT POINT AND SEAM WELDING OF HEAT-RESISTANT ALLOYS Abstract Only c37
V. M. Shornikov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 62 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 12, Dec. 1984 p 8-10 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Heat-resistant nickel and iron-nickel-based alloys, due to the broad temperature range of crystallization resulting from their complex chemical composition, frequently form defects when welded. The high resistivity of the alloys causes rapid increase in temperature at the contact point between parts, leading to a delay in the process of formation of the plastic face relative to melting of the metal. Stable, defect-free welds can be achieved only by smooth, continuous heating to assure optimum matching of the processes of temperature increase and rate of softening of the deformed metal. DC welding machines are best suited. Experiments were performed on KhN56VMTYu alloy, indicating that with great pulsations the core diameter develops largely in the plane of contact, since heat liberation to the electrode is increased, and melting increases more slowly. The diameter of the cast spot is less when pulsations are greater. Author

N85-25430# Joint Publications Research Service, Arlington, Va.
THERMOCOMPRESSION WELDING OF PARTS MADE FROM AMts AND VT1 ALLOYS Abstract Only c37
Ye. L. Mamutov and E. A. Tikhomirov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 62-63 Transl. into ENGLISH from Svarchnoye Proizv. (Moscow), no. 7, Jul. 1984 p 27-29 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Welding of titanium with aluminum by melting is difficult due

to the significant differences in their physical and chemical properties. Thermomechanical methods such as diffusion and thermal compression are therefore promising. The possibility and specifics of thermal compression welding of AMts aluminum alloy with VT1 titanium alloy are investigated. A mathematical model of the process is constructed, describing the quantitative variation in yield point in extension of joints as a function of factors influencing the welding pressure. It is shown that the qualitative conceptions concerning the mechanism of formation of joints agree with empirical opinions concerning the mechanism of formation of thermal compression joints, according to which joint strength depends on the degree of compression while being determined by geometric and kinetic interactions during plastic deformations. Author

N85-25431# Joint Publications Research Service, Arlington, Va.
MECHANICAL PROPERTIES OF WELDED JOINTS OF 1201 ALUMINUM ALLOY Abstract Only **c37**
V. I. Ryazantsev, Yu. I. Tolkachev, A. S. Roshchina, and R. G. Olkhovick *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 63 Transl. into ENGLISH from Svarochnoye pro Zvodstvo (Moscow), no. 7, Jul. 1984 p 29-30 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

Specimens of 1201 aluminum alloy 6 mm thick were cut from sheets, from hot-rolled plates 30 mm thick and from forged and rolled plates 80 mm thick as well as large forgings. Both manual and automatic welding in argon with AC and automatic welding in helium with DC were used. The highest and most stable strength and ductility properties were achieved by welding with DC under helium in two passes with cooling to 18 C to 30 C between passes. Joints made of the surface layers of the plates was significantly stronger than specimens cut from the core of the plates. The strength of joints welded across the fiber was 15 to 18% MPa higher than that obtained by welding along the fiber. The use of blanks with fiber in the direction of height in the welded zone results in a great decrease in strength and ductility. Welded joints with the seam root removed have the highest static and cyclical strength characteristics. Welded joints made of pressed strips are not recommended. Author

N85-25432# Joint Publications Research Service, Arlington, Va.
EFFECT OF PROTECTIVE ATMOSPHERE COMPOSITION ON DURABILITY OF WELDED JOINTS OF NIOBIUM ALLOYS Abstract Only **c26**
M. D. Rabkina, M. M. Nerodenko, S. M. Gurevich, E. S. Umanskiy, V. K. Kharchenko, V. V. Krivenyuk, G. E. Cholovskiy, G. D. Petrunin, and N. F. Chugay *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 64 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 11, Nov. 1984 p 112-118 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

The high-temperature durability under brief and prolonged loads of unalloyed niobium and Nb-Zr-C and Nb-W-Mo-Zr alloys was studied. Tests were conducted at temperature of 293 K to 1300 K at atmospheric pressure or 2.5 to 4 MPa vacuum, with controlled distortion and time periods. Deformation aging peaked at 875 K. Results show that weld seams contained oxygen and nitrogen impurities at intermediate temperatures. Durability peaks were accompanied by reduced plasticity. Reduction of welding speed increased interaction between metal and gas impurities. Added amounts of nitrogen in the protective atmosphere increased nitrogen and oxygen in the solid phase and formed an additional phase. Oxygen promoted elimination of carbon and retarded decomposition of the solid solution. Development of brittleness was determined by precipitation of zirconium oxides instead of carbides at crystallite boundaries. Oxygen content below 0.03% in the weld seam had little effect, but above that content low-temperature plasticity and impact strength declined. Author

24 COMPOSITE MATERIALS

Includes laminates.

N85-25433*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
CRACK GROWTH DIRECTION IN UNIDIRECTIONAL OFF-AXIS GRAPHITE EPOXY Interim Report
C. T. Herakovich, M. A. Gregory, and J. L. Beuth, Jr. Dec. 1984 32 p refs Sponsored in part by Hercules, Inc., Magna, Utah (Grant NAG1-343)
(NASA-CR-175752; NAS 1.26:175752; CCMS-84-17; VPI-E-84-34; IR-48) Avail: NTIS HC A03/MF A01 CSCL 11D

An anisotropic elasticity crack tip stress analysis is implemented using three crack extension direction criteria (the normal stress ratio, the tensor polynominal and the strain energy density) to predict the direction of crack extension in unidirectional off axis graphite-epoxy. The theoretical predictions of crack extension direction are then compared with experimental results for 15 deg off axis tensile coupons with center cracks. Specimens of various aspect ratios and crack orientations are analyzed. It is shown that only the normal stress ratio criterion predicts the correct direction of crack growth. Author

N85-25434*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.
FRACTURE SURFACE ANALYSIS IN COMPOSITE AND TITANIUM BONDING: PART 1: TITANIUM BONDING Final Technical Report
K. A. Sanderson and J. P. Wightman Apr. 1985 105 p refs (Grant NAG1-343)
(NASA-CR-175750; NAS 1.26:175750) Avail: NTIS HC A05/MF A01 CSCL 11D

Fractured lap shear Ti 6-4 adherends bonded with polyphenyquinoxaline (PPQ) and polysulfone were analyzed. The effects of adherend pretreatment, stress level, thermal aging, anodizing voltage, and modified adhesive of Ti 6-4 adherend bonded with PPQ on lap shear strength were studied. The effect of adherend pretreatment on lap shear strength was investigated for PS samples. Results of scanning electron microscopy (SEM) and X-ray photoelectron spectroscopy (XPS) used to study the surface topography and surface composition are also discussed. A.R.H.

N85-25435*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPECTROSCOPIC ANALYSIS OF RADIATION-GENERATED CHANGES IN TENSILE PROPERTIES OF A POLYETHERIMIDE FILM
Edward R. Long, Jr. and Sheila Ann T. Long May 1985 38 p refs
(NASA-TP-2429; L-15873; NAS 1.60:2429) Avail: NTIS HC A03/MF A01 CSCL 11D

The effects of electron radiation on Ultem, a polyetherimide were studied for doses from 2 x 10 to the 9th power to 6 x 10 to the 9th power rad. Specimens were studied for tensile property testing and for electron paramagnetic resonance and infrared spectroscopic measurements of molecular structure. A Faraday cup design and a method for remote temperature measurement were developed. The spectroscopic data show that radiation caused dehydrogenation of methyl groups, rupture of main-chain ether linkage, and opening of imide rings, all to form radicals and indicate that the so-formed atomic hydrogen attached to phenyl radicals, but not to phenoxyl radicals, which would have formed hydroxyls. The observed decays of the radiation-generated phenoxyl, gem-dimethyl, and carbonyl radicals were interpreted as a combining of the radicals to form crosslinking. This crosslinking is the probable cause of the major reduction in the elongation of the tensile specimens after irradiation. Subsequent classical solubility tests indicate that the irradiation caused massive crosslinking. A.R.H.

N85-25436*# National Aeronautics and Space Administration, Washington, D. C.

HIGH RESISTANCE AND RAISED MODULUS CARBON FIBERS
A. E. Standage and R. Prescott May 1985 21 p Transl. into ENGLISH of Belgian Patent no. 690072, 2 May 1967 p 1-17 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-76884; NAS 1.15:76884) Avail: NTIS HC A02/MF A01 CSCL 11D

The manufacturing process, test procedures and application of high strength, high modulus carbon fibers are described in this patent document. A.R.H.

N85-25437*# Clemson Univ., S.C. Dept. of Mechanical Engineering.
THE ACCURACY OF APPROXIMATE SOLUTIONS IN THE ANALYSIS OF FRACTURE OF COMPOSITES Semiannual Report
James G. Goree 1 May 1985 17 p refs
(Grant NsG-1297)
(NASA-CR-175738; NAS 1.26:175738) Avail: NTIS HC A02/MF A01 CSCL 11D

This paper concerns the accuracy of three related mathematical models (developed by Hedgepeth, Eringen and Sendeckyj and Jones) used in the stress analysis and in fracture studies of continuous-fiber composites. These models have particular application in the investigation of fiber and matrix stresses in unidirectional composites in the region near a crack tip. The interest in such models is motivated by the desire to be able to simplify the equations of elasticity to the point that they can be solved in a relatively easy manner. Author

N85-25438# United Kingdom Atomic Energy Authority, Harwell (England). Materials Development Div.
A PRELIMINARY INVESTIGATION INTO TRANSVERSE FRACTURE OF UNIDIRECTIONAL FIBER COMPOSITES
G. M. Wells Jan. 1985 65 p refs
(AERE-R-11494) Avail: NTIS HC A04/MF A01

The current literature is reviewed with emphasis on quantitative models of transverse composite fracture. The results of a comprehensive experimental investigation into the appropriateness of various test specimen configurations for strength determination of resin and transverse GRP are presented. From the results obtained comparisons of the critical defect sizes in resin and transverse composite are made. The phenomenon of fracture surface bridging by fiber stringers leading to the creation of a tied zone is discussed with reference to crack stability, and an energy balance model for individual stringers is presented which makes certain predictions about the nature of the tied zone, some of which are verified experimentally. Author

N85-25439# Naval Postgraduate School, Monterey, Calif.
DEVELOPMENT OF A FIELD REPAIR TECHNIQUE FOR MINI-SANDWICH KEVLAR/EPOXY AIRCRAFT SKIN M.S. Thesis
D. B. Cripps Jun. 1984 126 p
(AD-A151369) Avail: NTIS HC A07/MF A01 CSCL 01/3

An experimental analysis was performed on Kevlar/epoxy cloth mini-sandwich panels with cellular foam core. Three undamaged panels and twenty-three other panels with damage and repairs were subjected to static shear loading. Four parameters were varied in the types of repairs, hole size, hole plug filler material, patch material, and patch overlap distance. All twenty-six panels were tested to failure. A repair technique employing a cellular foam plug and fiber-glass patches overlapping the original hole by 0.50 inches, symmetrically applied with structural adhesive, was found to be suitable for repair of up to three inch diameter circular holes at field repair level. Additionally, postbuckling energy absorption was qualitatively examined for undamaged panels and for hole sizes ranging from 1 to 5 inches diameter. GRA

N85-25440# National Aeronautical Establishment, Ottawa (Ontario).
IN-PLANE SHEAR PROPERTIES OF GRAPHITE FIBRE/EPOXY COMPOSITES FOR AEROSPACE APPLICATIONS: EVALUATION OF TEST METHODS BY THE DECISION ANALYSIS TECHNIQUE
S. Lee and M. Munro (Ottawa Univ.) Oct. 1984 26 p
(AD-A151599; NAE-AN-22; NRC-23778) Avail: NTIS HC A03/MF A01 CSCL 11/4

This review is the first phase of a study of Matrix dominated properties of advanced composites materials for aerospace application. In this report, all the commonly used in-plane shear test methods are examined and discussed in detail. Using a decision analysis technique, three test methods are selected for further study. GRA

N85-25441# North Carolina Agricultural and Technical State Univ., Greensboro. Dept. of Mechanical Engineering.
EFFECT OF FATIGUE AND THERMAL LOADS ON SILICON CARBIDE FIBER REINFORCED GLASS MATRIX COMPOSITES Final Report, 15 Aug. 1983 - 30 Sep. 1984
V. S. Avva and J. Sankar 20 Nov. 1984 22 p refs
(Contract DE-AS05-83ER-45045)
(DE85-006069; DOE/ER-45045/2) Avail: NTIS HC A02/MF A01

The behavior of silicon carbide yarn imbedded in 7740 borosilicate glass matrix materials is being studied under cyclic loads and elevated temperatures. The cyclic loads were applied in tension-tension uniaxial mode with a stress ratio, R = 0.1. The testing is being continued at room temperature only. Some difficulties involved in fatigue-testing the materials that are highly brittle are addressed. DOE

N85-25442# California Univ., Livermore. Lawrence Livermore Lab.
MECHANICS OF POLYMERS AND COMPOSITES: RESEARCH OPPORTUNITIES
Richard M. Christensen 11 Jan. 1985 23 p
(Contract W-7405-eng-48)
(DE85-007052; UCID-20333) Avail: NTIS HC A02/MF A01

Two survey documents have been prepared on the mechanics of: Fiber Reinforced Composite Materials, and Polymers and Viscoelasticity. DOE

N85-25404# Joint Publications Research Service, Arlington, Va.
RESEARCH, DEVELOPMENT OF COMPOSITE MATERIALS DESCRIBED Abstract Only
A. Sviridenok *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 17-19 Transl. into ENGLISH from Sov. Belorus. (Minsk), 27 Nov. 1984 p 3 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25405# Joint Publications Research Service, Arlington, Va.
LOCAL ELASTOPLASTIC FRACTURE OF FIBROUS COMPOSITE MATERIALS Abstract Only
L. T. Berezhnitskiy and N. M. Kundrat *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1984 p 20 Transl. into ENGLISH from Fiz.-Khim. Mekhan. Mater. (Kiev), v. 20, no. 5, Sep. - Oct. 1984 p 57-64 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25607# Joint Publications Research Service, Arlington, Va.
PECHINEY STRATEGY INCLUDES DEVELOPMENT OF NEW MATERIALS
Jean Roume *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-4-008) 29 Feb. 1984 p 1-2 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 19 Jan. 1984 p 35 (For primary document see N85-25606 15-31)
Avail: NTIS HC A04/MF A01

N85-25785# Centre d'Etudes et de Recherches, Toulouse (France). Dept. d'Aerothermodynamique.
THREE-DIMENSIONAL BOUNDARY LAYERS AND SHEAR FLOWS ACTIVITIES AT ONERA/CERT
R. Michel *In* AGARD Three-Dimensional Boundary Layers Feb. 1985 15 p refs (For primary document see N85-25784 15-34)
Avail: NTIS HC A06/MF A01

N85-26594*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE PHYSICAL EFFECTS OF DIFFERENT STRESS SITUATIONS ON GRAPHITE/EPOXY COMPOUNDS
Derrick Brazill *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 21-28 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 11D

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N85-25443# National Aerospace Lab., Tokyo (Japan).
THE EFFECT OF AIR HOLES ON COMBUSTOR LINER WALL TEMPERATURE PROFILE: EXPERIMENTS
Kazuo Suzuki 1984 40 p refs In JAPANESE; ENGLISH summary
(NAL-TR-840; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

Combustor liners need air holes which inject air for combustion and for dilution. The jets from the air holes disrupt the cooling film flow and make intense turbulence on the downstream side of the holes. Therefore the wall temperature near the air holes tends to be higher. This temperature rise was examined using film cooling structure models with four slots. Two-dimensional wall temperature profiles were measured with a scanning-type infrared thermometer. The effect of each factor on the temperature rise; hole position, hole size and cooling slot structure was presented. And in order to investigate the airflows around the jets, flow temperature profile, pressure distortion and flow pattern were measured in detail. Author

N85-25444*# Louisiana State Univ., Baton Rouge. Dept. of Chemical Engineering.
SHOCK TUBE STUDY OF THE FUEL STRUCTURE EFFECTS ON THE CHEMICAL KINETIC MECHANISMS RESPONSIBLE FOR SOOT FORMATION, PART 2 Final Report
M. Frenklach, D. W. Clary, and M. K. Ramachandra May 1985 171 p refs
(Grant NAG3-477)
(NASA-CR-174880; NAS 1.26:174880) Avail: NTIS HC A08/MF A01 CSCL 21B

Soot formation in oxidation of allene, 1,3-butadiene, vinylacetylene and chlorobenzene and in pyrolysis of ethylene, vinylacetylene, 1-butene, chlorobenzene, acetylen-hydrogen, benzene-acetylene, benzene-butadiene and chlorobenzene-acetylene argon-diluted mixtures was studied behind reflected shock waves. The results are rationalized within the framework of the conceptual models. It is shown that vinylacetylene is much less sooty than allene, which indicates that conjugation by itself is not a sufficient factor for determining the sooting tendency of a molecule. Structural reactivity in the context of the chemical kinetics is the dominant factor in soot formation. Detailed chemical kinetic modeling of soot formation in pyrolysis of acetylene is reported. The main mass growth was found to proceed through a single dominant route composed of conventional radical reactions. The practically irreversible formation reactions of the fused polycyclic aromatics and the overshoot by hydrogen atom over its equilibrium concentration are the g-driving kinetic forces for soot formation. E.A.K.

N85-25445*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
OPTIMIZATION OF THE CATALYTIC OXIDATION OF CO FOR CLOSED-CYCLE CO2 LASER APPLICATIONS
I. M. Miller, G. M. Wood, D. R. Schryer, R. V. Hess, B. T. Upchurch (Old Dominion Univ.), and K. G. Brown (Old Dominion Univ.) Apr. 1985 12 p refs
(NASA-TM-86421; NAS 1.15:86421) Avail: NTIS HC A02/MF A01 CSCL 07D

This report develops a basis for the design of a catalyst bed for the recombination of CO and O2 in a closed-cycle CO2 laser system. The catalyst is 1% Pt on SnO2 having a BET surface area of 6.7 sq m/g and a specific void volume of 0.374 cu cm/g. The design conditions are: a catalyst bed temperature of 100 C and a circulating flow rate of 10 lambda/min. Under these conditions, the required quantity of catalyst for prolonged laser operation of 668g. The rat law for the reaction of a stoichiometric mixture of 1% CO + 1/2% O2 in helium was determined to be overall first order; however, additional experiments with non-stoichiometric gas mixtures of CO and O2 are needed to determine the order of the CO concentration and the order of the O2 concentration in the rate law. Author

N85-25446# New South Wales Univ., Kensington (Australia).
METAL COMPLEXES OF SOME HETEROCYCLIC LIGANDS M.S. Thesis. Abstract Only
Eddy Sudjana Ardiwinata 1984 3 p
Avail: NTIS HC A02/MF A01

Metal complexes of 3 substituted pyridazines were characterized by electronic spectra and magnetic measurements to low temperatures, by infrared and X-ray powder diffraction spectra, and by X-ray structure determinations. The complexes were compared with corresponding pyridine systems, for which new data are presented, in order to examine the influence of the additional 1 nitrogen atom in the pyridazine complexes. Author

N85-25447# Washington State Univ., Pullman. Dept. of Physics.
VAPOR EXPLOSIONS IN SUPERHEATED LIQUIDS AND FUNDAMENTAL STUDIES OF THE PHYSICS OF DETONATION Final Report, 1 Jun. 1981 - 30 Nov. 1984
G. R. Fowles Jan. 1985 9 p
(Contract DAAG29-81-K-0085)
(AD-A151362; ARO-18200.4-CH) Avail: NTIS HC A02/MF A01 CSCL 07/4

The experimental work was entirely devoted to developing the experimental technique. In this technique superheated states are produced by sudden adiabatic depressurization of fluids whose initial state lies on the liquid-vapor co-existence curve, as is done on a more modest scale in bubble chambers. The technique is still being perfected and although it appears to be feasible and nearly functional, no data have yet been taken. Significant degrees of superheat have been obtained for several milliseconds. The theoretical phase, on shock and detonation instabilities, appears to have successfully shown the connection between transverse wave instabilities and the observed three-dimensional structure of detonation waves. It indicates that such transverse wave structure might be expected in all detonation waves and that it is caused by a modified form of the transverse wave instability predicted for shocks in inert materials. GRA

N85-25448# Purdue Univ., Lafayette, Ind. Combustion Lab.
INFLUENCE OF FUEL PROPERTIES ON GAS TURBINE COMBUSTION PERFORMANCE Final Report, 3 Jan. 1983 - 30 Sep. 1984
A. H. Lefebvre Jan. 1985 157 p
(Contract F33615-81-C-2067)
(AD-A151464; AFWAL-TR-84-2104) Avail: NTIS HC A08/MF A01 CSCL 21/4

Results of an analytical and experimental program to determine the effects of broad variations in fuel properties on the performance, emissions, and durability of several prominent turbojet engine combustion systems, including both turbo-annular and annular configurations, are presented. Measurements of mean drop size conducted at representative engine operating conditions are used to supplement the available experimental data on the effects of combustor design parameters, combustor operating conditions and fuel type, on combustion efficiency, lean blowout limits, lean lightoff limits, liner wall temperatures, pattern factor, and pollutant emissions. The results of the study indicate that the fuel's physical

properties that govern atomization quality and evaporation rates strongly affect combustion efficiency, weak extinction limits, and lean lightoff limits. The influence of fuel chemistry on these performance parameters is quite small. Analysis of the experimental data shows that fuel chemistry has a significant effect on flame emissivity, flame radiation, and liner wall temperature, but its influence on the emissions of carbon monoxide, unburned hydrocarbons, and oxides of nitrogen, is small. Smoke emissions are found to be strongly dependent on combustion pressure, primary-zone fuel/air ratio, and the mode of fuel injection (pressure atomization or airblast). Fuel chemistry, as indicated by hydrogen content, is also important. GRA

N85-25449# Cornell Univ., Ithaca, N.Y. Lab. of Atomic and Solid State Physics.
C2H(n) FRAGMENTS ON METAL SURFACES Interim Technical Report
J. Silvestre and R. Hoffmann 22 Feb. 1985 130 p Submitted for publication
(Contract N00014-82-K-0576)
(AD-A151474; TR-13) Avail: NTIS HC A07/MF A01 CSCL 11/6

The chemisorption of an acetylene (HCCH), a vinylidene (CCH2) and an ethylidyne (CCH3) on metal surfaces, especially Pt(111) is analyzed in some detail, with an emphasis on the electronic rearrangements ensuing. The bonding is described in terms of semi-localized states, in turn obtained via a deconvolution of the total density of states into fragment orbitals of the hydrocarbon and the surface. The geometrical choices made by the various fragments on surfaces are analyzed by simple perturbation theory. It is found that in general the bonding within both the hydrocarbon fragment and the surface is dramatically weakened, as indicated by the changes in overlap populations that result. The more surface atoms are involved in anchoring the adsorbate, the weaker the bonding within the surface becomes. A non-dissociative chemisorption is the result of a compromise and is operative when the price of the binding energy is evenly distributed over the loss of bonding within the adsorbate and the surface. GRA

N85-25450# Cornell Univ., Ithaca, N.Y.
ASYMPTOTIC METHODS ESPECIALLY IN COMBUSTION Final Report, 15 Jun. 1981 - 30 Sep. 1984
G. S. S. Ludford Nov. 1984 10 p
(Contract DAAG29-81-K-0127)
(AD-A151505; ARO-18243.45-MA) Avail: NTIS HC A02/MF A01 CSCL 21/2

Modern asymptotic methods have been applied to a wide range of problems in combustion science as well as certain magnetohydrodynamic and fluid mechanical questions. Details are contained in the 49 technical reports and 4 Ph.D. Theses listed. Topics covered under this contract included: Asymptotic methods, combustion, DDT(Deflagration to Detonation Transition) near-stoichiometry, premixed and diffusion flames, droplet burning, stretch resistance, strain effects, effect of pressure variations, dissociation, non-dilute mixtures, wrinkled flames, burner flames, stability, quenching, heat loss, ignition and extinction, Chapman-Jouget limit, polyhedral flames, surface equilibrium, monopropellant, reactive atmosphere, stagnation-point flow, galloping detonations, flame bubbles, solidification fronts, Hartmann layers, intumescent paints, and flickering. GRA

N85-25451# Princeton Univ., N. J. Dept. of Chemical Engineering.
PHASE SEPARATION IN POLYURETHANES: A DEUTERIUM NMR STUDY
J. J. Dumais, L. W. Jelinski, L. M. Leung, I. Gancarz, and A. Galambos 18 Feb. 1985 20 p
(Contract N00014-84-K-0534)
(AD-A151515; TR-1) Avail: NTIS HC A02/MF A01 CSCL 11/9

Solid state deuterium NMR spectroscopy is used to address phase separation i specifically labeled polyurethanes. The hard segment is 4,4'-diphenyl-methane diisocyanate (MDI) chain extended with 2,2,3,3,-D SUB 4 butanediol and the soft segment is polyoxypropylene end-capped with oxyethylene. The samples contain 100, 70, 60 and 50 wt% hard segment. The results show: (1) that the core of the hard segment microdomains is identical to the pure hard segment material with respect to molecular motion; (2) that the amount of hard segment in the interfacial regions can be quantified; (3) that the NMR and SAXS data are in good agreement concerning the fraction of interfacial hard segment; and (4) that the interfacial hard segments undergo nearly isotropic motion on a 10,000,000/s time scale, suggesting that there are few long-lived interrurethane hydrogen bonding interactions in the interfacial area. GRA

N85-25452# Illinois Univ., Urbana. Dept. of Chemistry.
THERMOLYSIS OF 4-METHYL-4-(1-PROPENYL)MALONYL PEROXIDE: MECHANISTIC LIMITS TO CHEMILUMINESCENCE EFFICIENCY
J. E. Porter and G. B. Schuster 28 Feb. 1985 24 p
(Contract N00014-76-C-0745)
(AD-A151567; AD-E500700; TR-37) Avail: NTIS HC A02/MF A01 CSCL 07/4

The preparation and thermal chemistry of 4-methyl-4-(1-propenyl)malonyl peroxide (3) is described. Thermolysis in acetonitrile at 84 C gives 2,4-dimethylbut-2-ene-4-olide in 45% yield and oligomeric ester derived from an intermediate alpha-lactone in 55% yield. The reaction of 3 can be catalyzed by aromatic hydrocarbons such as perylene. Under these conditions weak chemiluminescence results. The mechanism for light generation is identified as chemically initiated electron-exchange luminescence (CIEEL). Application of the CIEEL mechanism to 3 reveals an important limitation to light generation by this path. GRA

N85-25453# Illinois Univ., Chicago. Chicago Circle.
NITROLYSIS OF THE CN SINGLE BOND AND RELATED CHEMISTRY OF NITRO AND NITROSO GROUPS Annual Report, 1 Jan. - 31 Dec. 1984
J. H. Boyer Feb. 1985 63 p
(Contract N00014-82-K-0210)
(AD-A151753) Avail: NTIS HC A04/MF A01 CSCL 07/3

For the efficient conversion of mono-tert-amines to nitrosamines treatment with dinitrogen tetroxide in an inert solvent at 0-45 has been developed. Attempts to oxidize the new R-salt carbinols A to RDX-ketones B have been unsuccessful. New attempts to achieve C-functionalization of RDX will be examined. Uncatalyzed debromination of nitrodibromoacetonitrile by treatment with tetramethylethylene, dimethyl sulfide, and triethylamine under mild conditions gave respectively 3-cyano-4,4,5,5-tetramethylisoxazol-2-ine-2-oxide, dimethylsulfonium cyanonitromethylide, and triethylammonium cyanonitromethylide. Base catalyzed conversions (SRN1 and related reactions) of nitroacetonitrile and phenylnitroacetonitrile were examined. The known compounds 5,7-dioxo (2,2,2)bicyclooct-2-ene and 2,6,7-trioxo(2,2,2)bicyclooctane were prepared for investigations designed to provide nitro derivatives. Oxime derivatives have been prepared for conversion to nitro derivatives. GRA

N85-25454# Ohio State Univ., Columbus.
AN ATLAS OF PURE WATER VAPOR SPECTRA FROM 500 TO 5000/CM, VOLUME 1 Technical Report
R. K. Long and E. K. Damon Sep. 1984 452 p
(Contract DAAG29-81-K-0084)
(AD-A151756; ESL-713774-3-Vol-1; ARO-17603.3-GS) Avail: NTIS HC A20/MF A01 CSCL 07/4

An atlas of the pure H2O absorption spectrum between 500 and 5000/cm is presented. This atlas presents laboratory absorption spectra of pure water vapor between 500 and 5000/cm. Volume I contains spectral plots and Volume II (AD-A151157) contains the line listings. For each frequency, four spectra are presented, from top to bottom: 5 Torr at 284 k; 10 Torr at 294.3 k; 20 Torr at 308 k; and 40 Torr at 320 k. The path length is 821 meters. Tables of approximate line frequencies are also included. GRA

N85-25455# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

SPECTROSCOPIC STUDIES OF LEAD OXIDE IN A FLOW TUBE M.S. Thesis

J. P. Duray 3 Dec. 1984 92 p

(AD-A151849; AFIT/GEP/PH/84D-2) Avail: NTIS HC A05/MF A01 CSCL 07/4

Chemiluminescent flame from lead oxide has been observed in a flow-tube reactor. The chemiluminescence was produced by the reaction of lead vapor with singlet delta oxygen, first electronically excited state of oxygen. Spectra was recorded using a monochromator and a photomultiplier tube (PMT). The spectra was recorded using a monochromator and a photomultiplier tube (PMT). The spectra was recorded from the PMT in the photon counting mode on a Signal Averager (Model 4203 EG&G PAR). The Signal Averager was operated in the multichannel scaling mode which records data in a histogram format. Analysis of the spectra led to assignments of electronic transitions from a, b, A, C, D, E to the ground state of PbO. Molecular constants were calculated from the combination of this data and previous data taken at the Air Force Institute of Technology. This thesis provides a table of molecular constants. The relative concentrations of excited Pb in the lead vapor were measured by using absorption spectroscopy techniques. The results were inconclusive because of light source stability problems. GRA

N85-25456# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

LINEWIDTH AND BANDWIDTH MEASUREMENTS OF THE q-BRANCH OF h2 USING CW COHERENT ANTI-STOKES RAMAN SPECTROSCOPY M.S. Thesis

D. W. Melton and A. M. Toich Dec. 1984 93 p

(AD-A151868; AFIT/GEP/ENP/84D-5) Avail: NTIS HC A05/MF A01 CSCL 07/4

The Raman linewidths of the H2 Q-branch transitions were determined using Coherent Anti-Stokes Raman Spectroscopy (CARS). A CW CARS system, employing a tunable dye laser for the Stokes beam and an argon ion laser to provide the pump beam, was used to excite the Q(0) through Q(3) transitions of H2. High resolution linewidth measurements were made at pressures ranging from .75 to 40 atm. A Fabry-Perot interferometer was used to provide a relative frequency marker for linewidth determination. The frequencies of these peaks were determined by comparison with an iodine absorption spectrum effect. All four lines showed pressure broadening and the Dicke narrowing effect. The pressure broadening coefficients for these lines were determined and compared to those obtained by other researchers using different methods. Narrowing of the band as a whole was observed with increasing pressure. The data demonstrated the effectiveness of the CW CARS system developed in this thesis an ultrahigh resolution spectroscopic system useful for studying other molecules. GRA

N85-25457# Oak Ridge National Lab., Tenn.

SECONDARY FLUORESCENCE EFFECTS ON X-RAY MICROANALYSIS

James Bentley, Peter Agnelini, and P. S. Sklad 1984 12 p refs Presented at the Microbean Analysis Society Anal. Electron Microscopy Meeting, Bethlehem, Pa., 16 Jul. 1984

(Contract DE-AC05-84OR-21400)

(DE85-005565; CONF-840767-15) Avail: NTIS HC A02/MF A01

Secondary fluorescence by backscattered electrons and X-rays produced by the interaction of the electron probe with the specimen was shown to lead to significant errors in energy dispersive X-ray spectroscopy (EDS). The suspected influence of secondary fluorescence effects on EDS analyses of intergranular phase in TiB2-Ni ceramics was assessed. It is demonstrated that secondary fluorescence can produce errors of up to 10% in compositions determined by X-ray microanalysis in an AEM. Secondary fluorescence effects increase as the specimen in tilted to greater angles. Preliminary analyses of P/B ratios indicate that backscattered electrons are more likely responsible for secondary fluorescence than high energy X-rays. DOE

N85-25458# Mason and Hanger-Silas Mason Co., Inc., Amarillo, Tex.

HIGH PERFORMANCE SIZE EXCLUSION CHROMATOGRAPHY (IX) BULK AND COMPONENT ANALYSIS OF SILANOL GROUPS IN POLYDIMETHYLSILOXANES: PROCESS DEVELOPMENT ENDEAVOR

Erwin Kohn Jan. 1985 13 p refs

(Contract DE-AC04-76DP-00487)

(DE85-006853; MHSMP-85-06; MHSMP-102) Avail: NTIS HC A02/MF A01

Methods for the bulk and molecular weight component analysis of hydroxyl groups attached to silicon in polydimethylsiloxanes of the Sylgard type were developed. The infrared (ir) absorbance band of the silanol adduct produced by hydrogen bonding with 1,4-dioxane is used. The determination of hydroxyl content as a function of molecular weight employs an on-line size exclusion chromatography-infrared (SEC-IR) technique. Interference by vinyl or phenyl groups in the sample or by traces of water in the solvent was negligible, but water or compounds containing other types of hydroxyl groups interfered/ Sensitivity of the method is about 10 (MU)g of the silanol, as OH in the polydimethylsiloxane. Primary calibration was by proton nuclear magnetic resonance (PNMR) at a high concentration of hydroxyl groups. DOE

N85-25459# North Carolina Univ., Chapel Hill. Dept. of Chemistry.

APPLICATIONS OF PHOTOINDUCED ELECTRON TRANSFER AND HYDROGEN ABSTRACTION REACTIONS TO CHEMICAL AND ELECTROCHEMICAL CONVERSION PROCESSES Final Report, 1 Mar. 1981 - 28 Feb. 1984

1984 20 p refs

(Contract DE-AS05-81ER-10815)

(DE85-006069; DOE/ER-10815/T1) Avail: NTIS HC A02/MF A01

Light-driven electron transfer and hydrogen atom abstraction processes was studied with emphasis on reactions giving rise to net chemical or electrochemical conversion. Substrates excitable with visible light were used ranging from metal complexes, porphyrins and metalloporphyrins to dyes and ketones and quencher-mediators capable of acting as electron donors or acceptors by virtue of having multiple closely spaced redox levels. The work is divided into five major areas: (1) generation and reaction of reducing and oxidizing radicals and radical ions in photoelectrochemical cells; (2) studies of Weitz-type quenchers having stable one-electron redox products; (3) two-electron oxidative and reductive quenching processes with Weitz-type systems in solution and organized media; (4) photoredox reactions of indigo dyes; and (5) modification of photochemical reactivity by formation of amylose inclusion complexes in aqueous and partially aqueous solutions. DOE

N85-25460# Bend Research, Inc., Oreg.

LIQUID MEMBRANES FOR THE PRODUCTION OF OXYGEN-ENRICHED AIR Final Report

R. W. Baker, J. Bentley, J. W. Brooke, B. M. Johnson, J. Kucera Gienger, H. K. Lonsdale, S. L. Matson, D. A. Myers, W. P. Robinson, and Smith I. C. Roman 23 Jan. 1985 155 p refs

(Contract DE-AC06-79ER-10337)

(DE85-006056; DOE/ER-10337/1) Avail: NTIS HC A08/MF A01

The liquid membranes developed consist of a solution of an oxygen carrier dissolved in a solvent that is immobilized within the pores of a microporous membrane support. With the imposition of a pressure difference across the liquid membrane, the oxygen carrier selectively transports oxygen across the membrane by a process called facilitated transport. An organometallic oxygen carrier that forms the basis of liquid membranes that are selectively permeable to oxygen over nitrogen was identified. This oxygen carrier has rapid oxygen-complexation kinetics a relatively long life -3 to 4 weeks. Membrane performance was optimized. Atmospheric CO2 was found to have a deleterious effect on membrane life. A hollow-fiber membrane configuration was developed and tested. Membrane flux, which is inversely proportional to membrane thickness, is the single most important factor

in determining capital costs of the liquid-membrane process. Immobilized-liquid membranes were developed with effective thicknesses down to 4 (MU)m; the highest oxygen flux observed through these membranes was about 3 standard cubic feet (SCF)/ft(2)-day. The oxygen/nitrogen selectivity of our preferred liquid membranes is about 25. A product oxygen purity of about 85% can be attained in a single pass through the membrane. DOE

N85-25461# Ames Lab., Iowa.
MICROSTRUCTURAL CHARACTERISTICS DURING THE CONTROLLED SOLIDIFICATION OF A BINARY SYSTEM Ph.D. Thesis - Iowa State Univ.
Khanchai Somboonsuk Dec. 1984 168 p refs
(Contract W-7405-eng-82)
(DE85-005200; IS-T-1154) Avail: NTIS HC A08/MF A01

Directional solidification experiments were carried out in the succinonitrile-acetone system to study transient and steady-state pattern formation of the interface. A study was made of the effect of experimental variables on the steady-state length characteristics of the interface pattern. Important scaling laws were also observed among various steady-state lengths. The coarsening phenomenon by which the secondary branches change their spacing with time was investigated, as the effect of velocity, temperature gradient and composition and the coarsening rate was measured. The conditions for the formation of tertiary branches were investigated and the mechanism by which tertiary branches become primary branches is proposed. These results were applied to understand the mechanism by which a chill crystal zone in a casting transforms to a columnar zone. DOE

N85-25462# Brookhaven National Lab., Upton, N. Y.
COMPUTER-ASSISTED GRAN TITRATION PROCEDURE FOR STRONG ACID DETERMINATION
M. F. Phillips, J. S. Gaffney, R. W. Goodrich, and R. L. Tanner Oct. 1984 36 p refs
(Contract DE-AC02-76CH-00016)
(DE85-006801; BNL-35734) Avail: NTIS HC A03/MF A01

An automated method for determining, by coulometric titration, small amounts of strong acid in the presence of weak acids is given. Essentially, a pH meter and a coulometer are coupled with a Tektronix 4052 minicomputer, and a two step computer program then directs the titration and calculates the equivalence point by the method of Gran. A comparison of precision and accuracy of results for test solutions by manual and automated data reduction methods is presented. The method is being used successfully to analyze for the H(+) content in ambient aerosol samples from aerometric field experiments, and can be used for cloud and rainwater samples as well. DOE

N85-25463# Colorado Univ., Boulder.
STUDIES OF METAL/CARBON SURFACE CHEMISTRY Technical Report, 1 Sep. - 31 Dec. 1984
B. E. Koel 13 Dec. 1984 4 p refs
(Contract DE-FG22-84PC-70779)
(DE85-005513; DOE/PC-70779/1) Avail: NTIS HC A02/MF A01

Stable surface species formed from molecular adsorption and reaction on metal/carbon surfaces were identified to improve the fundamental understanding of catalytic coal gasification. Well-defined model catalysts for carbon gasification are studied by vapor depositing alkali and transition metal atoms on carbon surfaces. Vibrational spectroscopy using high resolution electron energy loss spectroscopy (HRFELS) and photoelectron spectroscopy of these surfaces will be used to develop an atomic-level understanding of the chemical bonding, structure, and reactivity of the metal carbon surface and of the adsorbed molecular species. E.A.K.

N85-25464# Los Alamos Scientific Lab., N. Mex.
CON1D: A COMPUTER PROGRAM FOR CALCULATING SPHERICALLY SYMMETRIC DROPLET COMBUSTION
Robert D. Janssen and Peter J. ORourke Dec. 1984 57 p refs
(Contract W-7405-eng-36)
(DE85-005604; LA-10269-MS) Avail: NTIS HC A04/MF A01

The CON1D, a computer program which solves the balance equations describing the spherically symmetric vaporization or combustion of a liquid fuel droplet was documented. The CON1D is intended to complement the existing theory of droplet combustion by obtaining solutions in cases which are analytically intractable. Calculations are described which demonstrate the effects of gas phase unsteadiness on droplet vaporization. DOE

N85-25465# Washington Univ., Seattle. Dept. of Physics.
X-RAY SPECTROSCOPY OF SOLIDS UNDER PRESSURE Final Report, Aug. 1983 - Jul. 1984
R. L. Ingalls 18 Jan. 1985 7 p refs
(Contract DE-AT06-83ER-45038)
(DE85-006939; DOE/ER-45038/2) Avail: NTIS HC A02/MF A01

X-ray absorption of several materials as a function of pressure were performed. Of particular interest was the ExAFS (eXtended X-ray absorption fine structure) and XANES (X-ray absorption near edge structure). Materials studied include the alkali halides, NaBr and RbCl, zinc blend semiconductors ZnSe and CuBr and mixed-valence materials SmS and SmSe. In the former, the volume dependence of bond lengths and their mean square fluctuations were determined from the EXAFS. In the latter materials the XANES exhibited the pressure-induced change from the Sm(2+) configuration to Sm(3+). DOE

N85-25466# European Space Agency, Paris (France).
RESONANT COHERENT ANTI-STOKES RAMAN SCATTERING
Brigitte Attal Nov. 1984 206 p refs Translated into ENGLISH of "Diffusion Raman anti-Stokes Coherente a la Resonance Electronique" ONERA-P-1983-3 ONERA, Paris, 1983 Original language document was announced as ESA-92614
(ESA-TT-876; ONERA-P-1983-3) Avail: NTIS HC A10/MF A01

The advantages of resonant excitation are pointed and Coherent Anti-Stokes Raman Spectroscopy (CARS) properties are reviewed. The lines observed in coherent Raman scattering are resonantly enhanced; detectability is thus improved and the detection of trace components in gas mixtures becomes possible. By investigating the expression of the third order susceptibility, the main contributions were identified and classified. If the laser frequencies are tuned to the proper spectral domain, several denominators of these terms become simultaneously resonant. Double or triple resonances are obtained, depending on the particular case of the C2 radical. The performance of the CARS spectrometer was improved. Electronic enhancement is achieved by tuning the laser frequencies to the Swan system. Author (ESA)

N85-25467# Fraunhofer-Inst. fuer Angewandte Festkoerperphysik, Freiburg (West Germany).
INVESTIGATION OF ABSORPTIVE ELECTROCHEMICAL SYSTEMS FOR DISPLAY APPLICATIONS Final Report, Dec. 1983
Peter Schlotter, Lutz Pickelmann, Christa Vogel, Heidrun Biebl, and Heinz Strinitz Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 53 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-301; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11

The influence of the preparation conditions on the structure, the stability and the response time of electrochromic tungsten oxide layers used in display devices was investigated to optimize flash evaporation and reactive sputtering. High density tungsten oxide layers are deposited with increased elctrochemical stability in aqueous electrolytes and response time of 30 msec. With such layers 50 million color/bleach cycles can be obtained. In order to develop electrochromic displays which can be switched from transparent to black, other transition metal oxides, especially nickel oxide films, were investigated. The best electrochromic nickel oxide layers are prepared by reactive sputtering of NiCr-oxide films and a subsequent extraction of Cr. With these layers > 1 million color/bleach cycles are obtained. Author (ESA)

N85-25468# Research Triangle Inst., Research Triangle Park, N.C.
LITERATURE REVIEW FOR DEVELOPMENT OF THE MASTER ANALYTICAL SCHEME FOR ORGANIC COMPOUNDS IN WATER Final Report, Sep. 1978 - Jul. 1983
Jan. 1985 340 p
(Contract EPA-68-03-2704)
(PB85-152874; EPA-600/4-85-006) Avail: NTIS HC A15/MF A01 CSCL 07D

A state-of-the-art review was prepared covering analysis of organics in drinking water and surface waters as well as in waters from industrial, municipal, and energy sources. The areas reviewed included: (1) sampling; (2) techniques for component isolation and/or concentration; (3) extract fractionation; (4) chemical derivatization; (5) gas chromatography; (6) gas chromatography/mass spectrometry/computer techniques; and (7) quality control/quality assurance. The intial review is a prerequisite for experimental development of the EPA's Master Analytical Scheme for organics in water. GRA

N85-25469# Radian Corp., Austin, Tex.
THERMALLY MODULATED ELECTRON AFFINITY DETECTOR FOR PRIORITY POLLUTANT ANALYSIS Final Report
R. C. Hanisch, L. D. Ogle, A. E. Jones, and R. C. Hall Jan. 1985 57 p refs
(Contract EPA-68-03-2965)
(PB85-158145; EPA-600/4-85-009) Avail: NTIS HC A04/MF A01 CSCL 07D

A rapid, sensitive, and selective method is proposed for analyzing for chlorinated organic compounds at trace levels in complex samples. A detector concept in the gas chromatographic analysis of certain priority pollutants is based on the thermal alteration of a compound's electron affinity in a flow-through reactor, which can be used to modify the selectivity and sensitivity of the ECD to certain compounds. The TM ECD consists of two ECDs connected by a temperature-controlled reactor. Different classes of organic compounds respond to the reactor conditions in different ways: some compounds exhibit an enhanced ECD response after passing through the reactor; others a diminished signal; and still others no change in the magnitude of the signal. The ratio of a compound's response from the post-reactor ECD to that obtained from the prereactor ECD appears to be a property characteristic of each compound. This peak area ratio can be used in conjunction with its retention time to increase the confidence level of the identity of a given compound while still taking advantage of the excellent sensitivity characteristics of the ECD. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N85-25470 British Library Lending Div., Boston Spa (England).
INFLUENCE OF OXYGEN TRACES ON THE PROPERTIES OF TUNGSTEN HEAVY METALS
25 Mar. 1985 15 p Transl. into ENGLISH from Z. Werkstofftech. (West Germany), v. 15, 1984 p 96-102
(BLL-RARDE-Tr-1177-(7291.7965)) Avail: British Library Lending Div., Boston Spa, England

Differently sintered W heavy metals showed that careful pre-reduction before liquid phase sintering is essential for obtaining satisfactory mechanical properties: otherwise oxide layers at the phase boundaries deteriorate the interface strength and thus cause premature fracture. Understandably, the water vapour content of the furnace atmosphere is of considerable importance. Appropriate sintering anticipated, even severely oxidized green compacts result in highly ductile heavy metals. Addition of scavengers, Cr or V, instead of the pre-reduction improves the interface strength the mechanical properties however remain unsatisfactory. Author

N85-25471 United Kingdom Atomic Energy Authority, Risley (England).
MECHANICAL PROPERTIES OF TIN DEPOSITS OBTAINED BY PVD AND TIN, TIC, TIC + TIN OBTAINED BY CVD
J. P. Peyre 11 Mar. 1985 15 p refs Transl. into ENGLISH from Galvano-Organo-Traitements de Surface (France), no. 542, Jan. 1984 p 81-84
(BLL-Risley-Tr-5097-(9091.9F)) Avail: British Library Lending Div., Boston Spa, England.

Processes were developed to mitigate the substandard performance of certain thermochemical surface treatment grades when subject to very severe abrasive or corrosive stress. These processes provide for a very thin coating (a few micrometers) which is nonetheless very hard and, chemically speaking, very stable. The principle mechanical coatings used are based on carbides (Ti, Ci), nitrides (Ti) and oxides (Al). Author

N85-25472# California Univ., Berkeley. Dept. of Geology and Geophysics.
HYDROSTATIC COMPRESSION OF Fe1-CHI 0 WUSTITE.
Raymond Jeanloz and Yosiko Sato-Sorensen 1984 33 p refs
Avail: NTIS HC A03/MF A01

Hydrostatic compression measurements on Fe(0.95)O wustite up to 12 GPa yield a room temperature value for the isothermal bulk modulus of K(ot)=157 (+ or - 10) GPa at zero pressure. This result is in accord with previous hydrostatic and nonhydrostatic measurements of K(ot) for wustites of composition: 0.89 < = Fe/O < 0.95. Dynamic measurements of the bulk modulus by ultrasonic, shock-wave and neutron-scattering experiments tend to yield a larger value: K(ot) approximately 180 Gpa. The discrepancy between static and dynamic values cannot be explained by the variation of K(ot) with composition, as has been proposed. This conclusion is based on high-precision compression data and on theoretical models of the effects of defects on elastic constants. Barring serious errors in the published measurements, the available data suggest that wustite exhibits a volume relaxation under pressure. Author

N85-25473*# Textron Bell Aerospace Co., Buffalo, N. Y. Electroforming Operations Dept.
STUDY OF HIGH PERFORMANCE ALLOY ELECTROFORMING Monthly Technical Progress Narrative Report, 1 Apr. - 26 Apr. 1985
G. A. Malone 6 Jun. 1984 13 p
(Contract NAS8-35817)
(NASA-CR-175741; NAS 1.26:175741; MTPR-16) Avail: NTIS HC A02/MF A01 CSCL 11F

Using the two nickel-manganese alloy electroforming baths of near identical compositions, panels were electroformed under the same deposition parameters of current density, bath temperature, pH, and pulse plating conditions of duty cycle and frequency. By changing the electrolyte agitation conditions, significant effects on mechanical properties were noted. Since electrolyte agitation conditions on the typical flat panels studied to date will not be identical to those existing on a complex curved shape such as the SSME combustion chamber simulation, it is most important that these effects be evaluated prior to Phase B studies. The subscale chamber has been fabricated and shield support tooling is being made. Electroforming of optimized alloy test bars is being deferred until the electrolyte agitation effects are more fully appraised. Author

N85-25474# United Kingdom Atomic Energy Authority, Harwell (England). Materials Development Div.
THE DESIGN AND CONSTRUCTION OF A FLOW CHANNEL AND RIG FOR CORROSION STUDIES
J. Stewart Jan. 1985 24 p refs
(AERE-M-3455) Avail: NTIS HC A02/MF A01

A flow rig for studying th pitting corrosion of stainless steels under well defined hydrodynamic conditions was designed, constructed, and calibrated. Pitting under laminar flow, the effects of turbulence, and the effects of metallurgical variables on the initiation of pitting are studied. A.R.H.

N85-25475# United Kingdom Atomic Energy Authority, Harwell (England). Materials Physics and Metallurgy Div.
ULTRASONIC SH WAVE VELOCITY IN TEXTURED ALUMINUM PLATES
D. R. Allen, R. Langman (Tasmania Univ., Australia), and C. M. Sayers Jan. 1985 34 p refs
(AERE-R-11516) Avail: NTIS HC A03/MF A01

Neutron diffraction was used to measure the crystallite orientation distribution function for a sample of rolled aluminum plate. An expression is given for the ultrasonic velocity of the fundamental horizontally polarized shear wave propagating in the plane of the plate at an angle theta to the rolling direction. This expression is correct to second order in the leading texture component and is compared with the exact numerical result and with measurements of the SH wave velocity for this plate. In textured materials the group and phase velocities are not, in general, parallel and an expression for the angle between them is derived. Inclusion of this effect leads to better agreement between experiment and theory. The results have application to the texture independent determination of stress with ultrasonics. Author

N85-25476# United Kingdom Atomic Energy Authority, Harwell (England). Materials Physics and Metallurgy Div.
ANGULAR DEPENDENCE OF THE RAYLEIGH-SURFACE WAVE VELOCITY IN POLYCRYSTALLINE METALS WITH SMALL ANISOTROPY
C. M. Sayers Jan. 1985 18 p refs
(AERE-R-11595) Avail: NTIS HC A02/MF A01

An analytic expression for the angular dependence of the Rayleigh wave velocity on polycrystalline metals with small anisotropy is obtained using the variational method. For a Poisson's ratio v=1/4, this corrects the result obtained by Smith and Dahlen using the same method. Application is made to the Rayleigh wave velocity in hot rolled aluminium and steel plates. The results are shown to agree with the exact results obtained earlier for propagation along the principal axes of weakly textured metals with orthorhombic symmetry, this being the symmetry of rolled sheet. The results have application to the non-destructive measurement of residual stress in metals. Author

N85-25477# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
AN INVESTIGATION OF THE STRUCTURE AND HIGH TEMPERATURE MECHANICAL PROPERTIES OF OXIDE DISPERSION STRENGTHENED ALLOYS Interim Scientific Report, 1 Oct. 1983 - 30 Sep. 1984
W. D. Nix Dec. 1984 47 p
(Grant AF-AFOSR-0022-81)
(AD-A151107; AFOSR-85-0164TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

The structure and high temperature mechanical properties of oxide dispersion strengthened alloys are being studied. We have studied the creep and fracture properties of Inconel MA754 at very high temperatures. These properties depend both on the size distributions of the Y2O3 dispersoids (whick have been measured with small angle X-ray scattering) and on the morphology of the grain structure. We have also studied the high temperature flow properties of Al-Fe-Ce alloys made by RSR techniques. We have shown that the particles which strength this alloy are monoclinic Al13Fe4. The high temperature strength of the alloy is found to be limited both by coarsing of the precipitates and by precipitate twinning. Efforts to improve the high temperature strength of Al-Fe-Ce by mechanical alloying are underway. These studies include the development of techniques for making TEM thin foils from powders. GRA

N85-25478# Lehigh Univ., Bethlehem, Pa.
MECHANISMS OF CORROSION FATIGUE IN HIGH STRENGTH I/M (INGOT METALLURGY) AND P/M (POWDER METALLURGY) ALUMINUM ALLOYS Final Technical Report, 1 Jan. 1981 - 30 Sep. 1984
R. P. Wei and P. S. Pao (McDonnell Douglas Research Lab., St. Louis) Nov. 1984 145 p
(Contract F49620-81-K-0004)
(AD-A151177; IFSM-85-133; AFOSR-85-0163TR) Avail: NTIS HC A07/MF A01 CSCL 11/6

High strength aluminum alloys are employed extensively in the primary structure of current and projected Air Force and civilian aircraft. The service lives and reliability of these aircrafts depend to a great extent on the corrosion fatigue resistance of the structural alloys. Significant efforts are underway to develop powder metallurgy (P/M) alloys that would provide improved corrosion fatigue resistance along with improvements in other mechanical properties. The objective of this study was to understand the chemical and metallurgical aspects of environmentally assisted fatigue crack growth (or corrosion fatigue) that can serve: (1) as a basis for guiding the development of new and improved alloys, and (2) as a basis for developing rational design procedures for service life predictions. The kinetics of fatigue crack growth, as a function of water vapor pressure and for water vapor-oxygen mixtures, and the accompanying fractographic observations on 7050-T7451, 7050-T651 and 7075-T651 (I/M) alloys and on 7091-T7E69 and 7091-T7E70 (P/M) alloys are described and discussed. GRA

N85-25479# Lehigh Univ., Bethlehem, Pa. Center for Surface and Coatings Research.
CORROSION CONTROL THROUGH A BETTER UNDERSTANDING OF THE METALLIC SUBSTRATE-ORGANIC COATING-INTERFACE Annual Report, 1 Oct. 1983 - 30 Sep. 1984
E. M. Allen, F. M. Fowkes, R. D. Granata, R. W. Lovejoy, and J. F. McIntyre 13 Dec. 1984 284 p
(Contract N00014-79-C-0731)
(AD-A151238; AR-5) Avail: NTIS HC A13/MF A01 CSCL 11/3

The objective of this research is to obtain a better understanding of the metallic substrate/organic/interface system so that improvements may be made in corrosion control of metals by painting. The report this year includes a summary of progress made in 14 different components of the program. These activities are concerned with: (1) the chemical nature of the oxide on the surface of steel; (2) the loss of adhesion of an organic coating on a metal; (3) chemical modification of the surface of a metal; (4) the detection of water in a coating; and (5) the transport of species through organic coatings. GRA

N85-25480# National Bureau of Standards, Gaithersburg, Md. Metallurgy Div.
APPLICATION OF SOLIDIFICATION THEORY TO RAPID SOLIDIFICATION PROCESSING Semiannual Technical Report, 1 Apr. - 30 Sep. 1984
W. J. Boettinger, J. W. Cahn, S. R. Coriell, J. R. Manning, and R. J. Schaefer Feb. 1985 15 p
(ARPA Order 3751)
(AD-A151251) Avail: NTIS HC A02/MF A01 CSCL 11/6

Solidification theory can be used to predict and control processes occurring during rapid solidification. Two papers prepared for publication provide results showing such prediction: (1) the effects of rapid solidification velocity on microstructure and phase solubility extension in nickel aluminum-chromium quasibinary alloys are reported; (2) segregation behavior and microstructural spacings in silver-15 wt% copper alloys are reported as a function of solidification velocity around and below the transition velocity from cellular to banded microstructures. GRA

N85-25481# Defence Research Establishment Atlantic, Dartmouth (Nova Scotia).
CORROSION PROBLEMS IN THE CANADIAN MARITIME FORCES
R. S. Hollingshead and C. M. Hanham Dec. 1984 34 p
(AD-A151594; DREA-TM-84/BB) Avail: NTIS HC A03/MF A01 CSCL 13/10

The wastage of metals due to corrosion is one of the most serious engineering problems today and is of great economic concern. The Canadian Navy is very sensitive to the problems of corrosion and the importance of corrosion control not only because of the costs incurred but also because of the potential detrimental

effects on the operational capabilities of the ships and the safety of the crew. Investigations of corrosion related failures that have taken place on Canadian naval ships are described. The investigations are divided into three categories: Machinery, Seawater Systems and General. The Machinery category includes examples of corrosion problems with desuperheater tubes, gas turbine engine fuel manifolds, and waste heat and auxiliary boilers. The Seawater Systems category describes the erosion/corrosion of copper nickel pipes and pump impellers, and the crevice corrosion of a pump shaft. The General category includes corrosion problems with hulls and fasteners. All of the corrosion problems described can be eliminated or reduced a significant degree using modern corrosion control practices. GRA

N85-25482# Department of the Air Force, Washington, D.C.
OPTIMIZING HOT WORKABILITY AND CONTROLLING MICROSTRUCTURES IN DIFFICULT TO PROCESS HIGH STRENGTH AND HIGH TEMPERATURE MATERIALS Patent Application
H. L. Gegel, inventor (to Air Force) Filed 6 Feb. 1985 65 p
(AD-D011586; US-Patent-Appl-SN-698728) Avail: NTIS HC A04/MF A01 CSCL 11/6

An improved hot forming method for metals, alloys and the like, and in particular, for difficult to process high strength and high temperature metals and alloys of particular use in aerospace applications, is described, which comprises the steps of generating flow stress data as a function of strain rate and temperature on samples of the material at predetermined strain within predetermined ranges of temperature and strain rate; determining from that data the strain rate sensitivity and power dissipation efficiency of the material within the ranges of temperature and strain rate represented by the generated data; selecting values of strain rate and corresponding temperature for a selection value of the dissipation efficiency for the material; and hot forming the material at the selected strain rate and temperature values to a predetermined shape. The improved method may be of particular application to forging, extrusion, rolling or other hot forming process appropriate for titanium, aluminum, nickel, cobalt, copper, iron, zirconium and their alloys. A processing map for hot forming each metal or alloy may be generated according to the methods taught. GRA

N85-25483# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MOSSBAUER SPECTROMETRY: TESTING OF A NEW COMPUTER BASED SYSTEM AND ITS APPLICATION TO A STUDY OF AN ALUMINUM-IRON-CERIUM ALLOY M.S. Thesis
J. F. Harmon, Jr. 16 Mar. 1984 80 p
(AD-A151826; AFIT/GNE/PH/84M-6) Avail: NTIS HC A05/MF A01 CSCL 11/6

In this thesis, a computer based Mossbauer spectrometer was built using a new MS-900 spectrometer, an Apple 2+ computer system, and a PDP 11/03 computer system. The APPLE was used as the link between the spectrometer and the PDP, which is used to analyze the Mossbauer spectra. In addition to minor hardware connections, software changes were made to the analysis program so that it could accept the data format produced by the new spectrometer. Due to equipment failure, only preliminary tests were made of the new system, however the tests were positive. Originally, an Al-Fe-Ce alloy was chosen to be studied by the new system. Instead, the alloy, chosen because of its excellent high temperature properties, was studied by the original Mossbauer spectrometer system. The goal was to follow and identify changes in the microstructure of the alloy due to different processing stages. Although changes in the spectra were identified with processing stages, it is still unclear as to what compounds are related to the observed spectra. GRA

N85-25484# McDonnell-Douglas Research Labs., St. Louis, Mo.
METALLURGICAL CHARACTERIZATION OF ALUMINUM POWDER CONSOLIDATION Annual Technical Report, 1 Sep. 1983 - 1 Sep. 1984
S. M. L. Sastry, T. C. Peng, D. M. Bowden, and J. E. ONeal Sep. 1984 45 p
(Contract F49620-83-C-0152)
(AD-A151990; AFOSR-85-0254TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

The influence of metallurgical and process variables on the consolidation, densification, and properties of rapidly solidified aluminum alloy powders is being investigated. Cold compaction, hot pressing, powder extrusion, and explosive consolidation are being used to consolidate rapidly solidified 9.9% aluminum powder (reference material), Al-3Li-1Cu-1Mg-0.2Zr (a representative low-density, high-modulus alloy), and Al-8Fe-7Ce alloys (representative of high-temperature Al alloys). The alloys included in the study provide wide variations in hardness, flow stress, work hardening rate, plasticity, and oxide-film thickness. The consolidation techniques selected for the study provide variations in pressure, compaction rate, and extent of oxide-film breakdown. Three 35-kg lots of rapidly solidified alloy powders were prepared by vacuum atomization; and the powders were characterized with respect to particle size distribution, cooling rates, constituent phases, and volatile contaminants. The pressure dependence of densification during cold compaction was correlated with the yield stress and work hardening of the three alloys. GRA

N85-25485# Naval Postgraduate School, Monterey, Calif.
SUPERPLASTICITY IN A THERMO-MECHANICALLY PROCESSED ALUMINUM-10.2%Mg-0.52%Mn ALLOY M.S. Thesis
M. E. Mills Sep. 1984 116 p
(AD-A152016) Avail: NTIS HC A06/MF A01 CSCL 11/6

This research extended the previous work performed by Becker on the elevated temperature deformation characteristics of an aluminum-10.2% magnesium-0.52% manganese alloy. The alloy was warm rolled at 300 C to 94% reduction. Stress-strain testing was utilized to collect data for stress vs strain rate and ductility vs strain rate, as well as, stress exponents and activation energies. Tensile testing was performed at strain rates at .000-139 per sec and temperatures from 20 C to 425 C. Ductility ranged from 400% at 300 C and 600% at 325 C to 700% at 425 C. The data clearly establishes that the warm rolled alloy is superplastic at temperatures as low as 275 C and may exhibit superplastic elongations (greater than 400%) at strain rates at high as .01 per sec at 325 C. Scanning electron microscope observations indicated little or no void formation at or below 300 C. The high ductilities observed at temperatures above the solvus are the result of grain boundary sliding. GRA

N85-25486# Department of the Air Force, Washington, D.C.
CORROSION INHIBITOR FORMULATION FOR MOLYBDENUM, TUNGSTEN AND OTHER METALS Patent Application
M. R. Palmer, inventor (to Air Force) Filed 27 Nov. 1984 16 p
(AD-D011593; US-Patent-Appl-SN-675115) Avail: NTIS HC A02/MF A01 CSCL 11/3

In this patent application, the corrosion of molybdenum metal surfaces which come in contact with water-coolant systems is inhibited by the addition of a small amount of a composition containing a combination of a triazole inhibitor, a biocide and a buffering agent. A corrosion inhibiting composition containing benzotriazole as the inhibitor and benzoic acid as both a biocide and buffer proved to be especially effective in preventing the corrosion of molybdenum, tungsten and other metals. GRA

N85-25487# Rockwell International Corp., Golden, Colo.
THE CORROSION RESISTANCE OF ZINC COATINGS ON DEPLETED URANIUM AND URANIUM ALLOYS
J. L. Briggs, C. A. Deitesfeld, ed., and L. M. Morales 27 Jan. 1985 25 p refs
(Contract DE-AC04-76DP-03533)
(DE85-007216; RFP-3651) Avail: NTIS HC A02/MF A01

Simulated atmospheric corrosion studies were performed to determine the corrosion protection provided by galvanized zinc coatings on depleted uranium, U-0.75 Ti alloy, and U-6 Nb alloys. The accelerated tests consisted of exposing the galvanized samples to aqueous and aqueous chloride environments. The test results showed that anodic protection was provided by the electronegative zinc coatings on uranium and uranium alloys.

Treating zinc with chromate conversion coatings also provided more protection. DOE

N85-25488# Oak Ridge Gaseous Diffusion Plant, Tenn. Analytical Chemistry Dept.

TRACE METAL DETERMINATIONS IN NICKEL-PLATING BATHS BY POLAROGRAPHIC METHODS

M. R. Powell, C. R. Kirkpatrick, and H. H. Sullivan 31 Jan. 1985 15 p refs

(Contract DE-AC05-84OT-21400)

(DE85-007064; K-2049) Avail: NTIS HC A02/MF A01

The use of polarographic methods to determine 0.1 to 50.0 mg/1 quantities of the trace metals arsenic, antimony, bismuth, copper, cadmium, and lead in nickel-plating baths is described. Except for arsenic, these elements are determined simultaneously without sample preparation. A comparison of the lead results obtained by polarography and colorimetry emphasizes the advantages of polarography to determine trace elements in such baths. DOE

N85-25489# Argonne National Lab., Ill. Materials Science and Technology Div.

EFFECTS OF PRIMARY RECOIL ENERGY ON THE PRODUCTION RATE OF MOBILE DEFECTS DURING ELEVATED TEMPERATURE IRRADIATION

P. R. Okamoto, D. E. Rehn, and R. S. Averback Nov. 1984 17 p refs Presented at the 1st Intern. Conf. on Fusion Reactor Mater., Tokyo, 3-6 Dec. 1984

(Contract W-31-109-eng-38)

(DE85-006218; CONF-841246-19) Avail: NTIS HC A02/MF A01

Radiation-induced segregation rates in a Ni-12.7 at .% Si alloy have been measured as a function of temperature using ions of various masses and energies. An analysis of the segregation kinetics using a simple analytical model yielded the relative efficiency of each of the ions for producing mobile defects directly from ratios of their measured segregation rates. In this paper, we also show that the relative efficiencies can also be determined from measured shifts in the peak segregation temperature. Both methods yield a strong decrease in efficiency with increasing ion mass. The reduction in efficiency for the heavier ions was found to be significantly larger than that measured at very low temperatures by resistivity techniques. The latter are often used as a basis for correlating damage structures produced at elevated temperatures. Differences between the low and high temperature measurements indicate that relative efficiencies determined from segregation measurements are more reliable for correlating microstructural changes that are produced in different irradiation environments at high temperatures. DOE

N85-25490# Argonne National Lab., Ill. Materials Science and Technology Div.

ION BEAM MIXING OF MARKER LAYERS IN Al AND Si

S. Mantl (Kernforschungsanlage), L. E. Rehn, R. S. Averback, and L. J. Thompson, Jr. 1984 11 p refs Presented at Ion Beam Modification of Mater. Conf., Ithaca, N.Y., 16 Jul. 1984

(Contract W-31-109-eng-38)

(DE85-006227; CONF-840760-17) Avail: NTIS HC A02/MF A01

Ion beam mixing experiments on thin Pt, Au, and Ni markers in Al and Si were performed at 17, 85, and 300 K. After irradiation with 300-keV Ar ions the broadening and relative shifts of the markers were determined. The marker broadenings are more pronounced in Si than in Al; in both matrices the broadenings decrease in the following order: Au, Pt, and Ni. No dependence of mixing on irradiation temperature was observed between 17 and 300 K. The shifts of the heavy Au and Pt markers relative to the Ni markers are approximately equal to the experimental accuracy. However, a shift of the Ni marker toward the surface relative to the heavier Au and Pt markers was consistently observed. DOE

N85-25491# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.

DESIGN OF DUCTILE POLYCRYSTALINE NI3AI ALLOYS

C. T. Liu and C. L. White 18 Dec. 1984 18 p refs Presented at Mater. Res. Soc. Ann. Meeting, Boston, 26 Nov. 1984

(Contract DE-AC05-84OR-21400)

(DE85-005572; CONF-841157-63) Avail: NTIS HC A02/MF A01

Microalloying is effective in alleviating the grain-boundary embrittlement problem in Ni3Al alloys. The ductility and fabricability of Ni3Al (24 at. % Al) are dramatically improved by adding a few hundred parts per million of boron. Alloy stoichiometry strongly influences grain-boundary chemistry, which, in turn, affects the boundary cohesion and overall ductility of Ni3Al. The solid-solution hardening of Ni3Al depends on the substitutional behavior of alloying elements, atomic size misfit, and the degree of non-stoichiometry of the alloy. Hafnium additions improve high-temperature properties of ternary Ni3Al doped with boron. Alloying with less than or equal to 2% Ef substantially increases the yield stress and raises the peak-strength temperature. In addition, hafnium substantially improves creep properties and oxidation resistance. The Ni3Al aluminides truly represent a series of heat resistant materials which do not depend on chromium for oxidation resistance. DOE

N85-25492# Cornell Univ., Ithaca, N.Y.

SUMMARY OF RECENT INVESTIGATIONS OF THE MECHANICAL PROPERTIES OF POLYCRYSTALLINE SOLIDS Final Report

Che-Yu Li and Subrata Mukherjee Feb. 1984 140 p refs

(Contract DE-AC02-82ER-12038)

(DE85-006776; DOE/ER-12038/14) Avail: NTIS HC A07/MF A01

The development of a state variable description of the mechanical behavior of polycrystalline materials and its success is discussed. A wide range of mechanical deformation phenomena and deformation conditions was examined. DOE

N85-25493# Naval Postgraduate School, Monterey, Calif.

VARIATION IN THE SPACING OF DISLOCATIONS IN SUBGRAIN BOUNDARIES WITH CREEP STRAIN IN TYPE 304 STAINLESS STEEL

M. E. Kassner and J. W. Elmer (MIT, Cambridge) 4 Jan. 1985 7 p refs Proposed for presentation at 7th Intern. Conf. on the Strength of Metals and Alloys, Montreal, 12 Aug. 1985

(Contract W-7405-eng-48)

(DE85-006184; UCRL-91848; CONF-850823-2) Avail: NTIS HC A02/MF A01

The effect of varying strain upon the spacing of dislocations in subgrain boundaries in Type 304 stainless steel torsionally deformed at 1138(0) K (0.63 T sub m) was studied. It was found that the spacing, d, decreased with strain during both transient (primary) and steady-state (secondary) creep. It also appeared that the average subgrain size, lambda, decreased with strain during steady state. The results suggested that these two features may not strongly influence creep strength. DOE

N85-25494# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Chemical Engineering.

EFFECTS OF ION BOMBARDMENT ON THE MORPHOLOGY OF LEAD FILMS M.S. Thesis

M. J. Armstrong and R. H. Muller Dec. 1984 99 p refs

(Contract DE-AC03-76SF-00098)

(DE85-007234; LBL-18599) Avail: NTIS HC A05/MF A01

The effects of ion bombardment on the morphology of compact lead films were investigated with spectroscopic ellipsometry, Auger electron spectroscopy (AES), and scanning electron microscopy. Lead films of under 100 nm in thickness were prepared by electrodeposition and vacuum-vapor deposition. In contrast to the expected uniform removal of the surface by ion bombardment, assumed in the determination of composition by AES, a nonuniform removal of the surface was found to occur resulting in pitting or island formation. This pitting is independent of the mode of formation of the film and the presence of an oxide overlayer. an optical model of a film distributed as islands was used to interpret spectroscopic ellipsometry measurements. The model was based on the coherent superposition of polarization states resulting from reflection on the bare and film-covered surfaces. Scanning electron

micrographs confirmed the use of the island model for the surface morphology. The surface coverage of lead calculated from spectroscopic ellipsometry agrees well with the results of Auger electron spectroscopy measurements. DOE

N85-25495# Hanford Engineering Development Lab., Richland, Wash.
SWELLING BEHAVIOR OF MANGANESE-BEARING AISI 216 STEEL
D. S. Gelles and F. A. Garner 1984 10 p refs Presented at the 1st Intern. Conf. on Fusion Reactor Mater., Tokyo, 6-8 Dec. 1984
(Contract DE-AC06-76FF-02170)
(DE85-005712; HEDL-SA-3150FP; CONF-841246-13) Avail: NTIS HC A02/MF A01

The development of low activation alloys, specifically those based on the substitution of manganese for nickel as an austenite stabilizer is discussed. Manganese stabilized alloys already subjected to irradiation were examined. The inclusion of 8.5 wt% manganese in AISI 216 does not appear to alter the swelling behavior from that found to be typical of austenitic alloys with comparable levels of other austenite-stabilizing elements. The swelling in AISI 216 in BBR-II is quite insensitive to irradiation temperature in the range 400 to 650 C. It is shown that this may arise from the low level of precipitation that occurs in the alloy. DOE

N85-25496# Oak Ridge National Lab., Tenn.
WELDABILITY OF Ni3Al-TYPE ALUMINIDE ALLOYS
M. I. Santella, S. A. David, and C. L. White 1984 9 p refs Presented at Mater. Res. Soc. Ann. Meeting, Boston, 26 Nov. 1984
(Contract DE-AC05-84OR-21400)
(DE85-006932; CONF-841157-78) Avail: NTIS HC A02/MF A01

If the ductile Ni3Al-based aluminides are to achieve their full potential as engineering materials, they must demonstrate a capability for being joined by conventional welding processes. The goal was to identify some of the factors controlling weldability of the ductile aluminides. The alloys selected for this initial study were boron-doped Ni3Al and Ni3Al containing 10 at. % Fe. Sheet rock was used to make full penetration autogenous welds by the electron beam and gas tungsten arc processes. The main process variables were travel speed and preheat. The as-welded coupons were examined visually and by normal metallographic methods. Although sound welds were made, initial results indicated weldments of these alloys are susceptible to cracking. Weldability of the ductile Ni3Al-based aluminides was found to be affected by alloy composition and welding speed. DOE

N85-25497# Oak Ridge National Lab., Tenn.
OXIDATION OF NICKEL-ALUMINUM AND IRON-ALUMINUM ALLOYS
J. V. Cathcart 26 Nov. 1984 15 p refs Presented at Mater. Res. Soc. Ann. Meeting, Boston, 26 Nov. 1984
(Contract DE-AC05-84OR-21400)
(DE85-006930; CONF-841157-79) Avail: NTIS HC A02/MF A01

The high temperature oxidation behavior of several ordered alloys in the Ni-Al and Fe-Al systems is reviewed with special emphasis on Ni3Al and NiAl. Ordering influences oxidation through its effect on the activities of the alloy components and by changing the point defect concentration in an alloy. Three categories of Ni-Al alloys are distinguished based on Al content and oxidation behavior. A characteristic feature of the oxidation of high-aluminum Ni-Al and Fe-Al alloys is the formation of voids in the substrate at the oxide-metal interface. The mechanism of void formation and its suppression by minor additions of oxygen-active elements are discussed. The effect of pre-oxidation on the reactions of Ni3Al-base alloys in SO2/O2 environments is also described. DOE

N85-25498# California Univ., Fullerton.
COMPARATIVE SINTERABILITY OF COMBUSTION SYNTHESIZED AND COMMERCIAL TITANIUM CARBIDES
B. W. Manley Nov. 1984 66 p refs
(Contract W-7405-eng-48)
(DE85-006255; UCRL-15648) Avail: NTIS HC A04/MF A01

The influence of various parameters on the sinterability of combustion synthesized titanium carbide was investigated. Titanium carbide powders, prepared by the combustion synthesis process, were sintered in the temperature range 1150 C to 1600 C. Incomplete combustion and high oxygen contents were found to be the cause of reduced shrinkage during sintering of the combustion synthesized powders when compared to the shrinkage of commercial TiC. Free carbon was shown to inhibit shrinkage. The activation energy for sintering was found to depend on stoichiometry (C/Ti). With decreasing C/Ti, the rate of sintering increased. DOE

N85-25499# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
TEMPERATURE, VELOCITY, AND SPECIES MAPPING IN AN INDUCTION PLASMA
A. D. Donaldson, J. A. Batdorf, J. R. Fincke, D. J. Varacalle, Jr., and L. S. Richardson 1984 9 p refs Presented at the Mater. Res. Soc. Ann. Meeting, Boston, 26 Nov. 1984
(Contract DE-AC07-76ID-01570)
(DE85-004005; EGG-M-14284; CONF-841157-28) Avail: NTIS HC A02/MF A01

As part of an effort to determine the feasibility of carbothermic reduction of alumina in plasmas, spatial distributions of temperature, velocity and species in the plume of an argon radio-frequency plasma with alumina and carbon additions were estimated using a two-dimensional theoretical model of the flow field and a thermochemical model based on equilibrium conditions. Experimentally determined boundary conditions were input to the models. Using a 30 kW inductively coupled plasma, experimental measurements were made to allow comparison with predictions. A practical process for carbothermic reduction will require prevention of back reactions, either by separation of the aluminum species or by some kind of quenching of the process. The significance of the experimental results and comparisons with predictions are discussed. DOE

N85-25500# University of Mining and Metallurgy, Leoren (Austria). Inst. fuer Metallkunde und Werkstoffpruefung.
INFLUENCE OF SOLIDIFICATION PARAMETERS ON THE FORMATION OF THE GAMMA-M7C3 EUTECTIC STRUCTURE OF 2% C-12%Cr STEEL
Y.-K. Jang, M. H. Poech, and F. Jeglitsch 1984 11 p refs In GERMAN; ENGLISH summary Presented at Metallog. Tagung, Neu-Ulm, West Germany, 26-28 Sep. 1984
Avail: NTIS HC A02/MF A01

The dependence of the cast eutectic structure in the tool steel D2 on cooling was investigated in unidirectional solidification experiments. Volume part, size, and spacings of the interdendritic eutectic areas and of the M7C3-carbides were measured by an automatic image analyzer. The results of the measurements are discussed in relation to the dendritic growth. The carbide morphology was studied on deep etched samples with the scanning electron microscope. Author (ESA)

N85-25501# Philips Zentrallaboratorium G.m.b.H., Hamburg (West Germany).
STRUCTURE OF CONDENSED ALUMINUM THIN FILM METALLIZATIONS
Susanne Juergensen, Karin Pape, and Hartmann Hieber 1984 10 p refs In GERMAN; ENGLISH summary Presented at Metallog. Tagung, Neu-Ulm, West Germany, 26-28 Sep. 1984
Avail: NTIS HC A02/MF A01

The grain structure of pure, evaporated Al films were investigated. The Al films have an inhomogeneous grain size distribution due to dynamic grain growth during deposition. A preparation technique suitable for transmission electron microscopy was applied to determine the grain shape at the interface with the substrate and with the surface. The orientations of the grains perpendicular to the film plane are (111) and (011). Adjacent grains with similar

orientation are turned at the common large-angle grain boundaries. Author (ESA)

N85-25502# Bureau of Mines, Albany, Oreg.
REDUCED-CHROMIUM STAINLESS STEEL SUBSTITUTES CONTAINING SILICON AND ALUMINUM
M. L. Glenn and D. E. Larson 1984 20 p refs
(PB85-160786; BM-RI-8918; LC-84-600213) Avail: NTIS HC A02/MF A01 CSCL 11F

The Bureau of Mines is conducting research on Fe-based alloys using Si and Al additions to reduce the Cr required for heat-resisting applications. Part of this research is being done to evaluate alloys containing (8-10)Cr-(10-14)Ni-(0-8.5)Si-(0-4)Al to determine which of these alloys have austenitic structures, as well as fabrication properties and oxidation resistance sufficient to substitute for Type 304 stainless steel. Based on initial results, an Fe-10Cr-11Ni-5Si alloy and an Fe-8Cr-13Ni-5Si alloy were selected for evaluation of oxidation, stress rupture, and tensile properties. Author (GRA)

N85-25503# Joint Publications Research Service, Arlington, Va.
USSR REPORT: MATERIALS SCIENCE AND METALLURGY
6 May 1985 59 p Transl. into ENGLISH from various Russian articles
(JPRS-UMS-85-004) Avail: NTIS HC A04/MF A01

News items, abstracts and scientific reports on materials science and metallurgy including welding, aluminum alloys, magnesium alloys, titanium alloys, heat resistant alloys, graphite, corrosion, coatings, and amorphous metals are given. For individual titles, see N85-25504 through N85-25519.

N85-25504# Joint Publications Research Service, Arlington, Va.
EFFECT OF ZIRCONIUM ON FORMING ULTRAFINE-GRAINED STRUCTURE IN Al-Mg-Zr ALLOY Abstract Only
M. Kh. Rabinovich, N. K. Tsenev, and R. Z. Valeyev *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 1 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metally (Moscow), no. 6, Nov. - Dec. 1984 p 143-149 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

Introduction of zirconium into aluminum alloys promotes formation of a stable ultrafine grained (UFG) structure required for achieving ultraplasticity in such an alloy. The effects of increased amounts of Zr in these alloys is reported. An aluminum alloy with 1.58% Mg by weight was compared to one with 0.3% Zr by weight in addition to the magnesium. Castings were produced by various methods at 900 C, then annealed at 400, 450 and 500 C for 24 or 48 hours followed by water cooling. Then diffratometric analysis was made of the state of the resulting solid solution. Results showed that with retarded crystallization, the zirconium brought quick pulverization of macrogranules. Zirconium that was not bonded in intermetallides remained in solution, bringing its further saturation. During annealing of the triple alloy, the period of grating was also increased, especially with accelerated crystallization. This was related to emission of a triple phase containing all three elements, and in turn brought a homogenized fine grained structure with retarded crystallization, and with accelerated crystallization, cold deformation and annealing to an irregular structure. Author

N85-25505# Joint Publications Research Service, Arlington, Va.
ELECTROCHEMICAL BEHAVIOR OF AMORPHOUS ALLOYS BASED ON IRON, COBALT AND NICKEL IN H3PO4 SOLUTIONS ALONE AND MIXED WITH HF Abstract Only
E. A. Zhivotovskiy, O. N. Telmanova, V. M. Shtanko, O. N. Gavrilova, and L. G. Chepurova *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 2 Transl. into ENGLISH from Zashchita Metal. (Moscow), v. 21, no. 1, Jan. - Feb. 1985 p 106-108 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

Electrochemical polishing of both amorphous and crystalline alloys, which frequently involves phosphoric acid, has received little scientific attention. Electrochemical properties and potential of amorphous alloy strips in solutions of H3PO4 alone and in combination with HF are studied. The test alloys were (by atomic weight) Co60Fe5Ni10Si10B15 and Fe40Ni38Mo4B18 produced by rapid cooling on a rapidly revolving cylinder. Strips of the alloy were cleaned with ethyl alcohol, and tests were made of matte and polished surfaces of each metal. Results showed that polished surfaces had markedly more negative potential than those with matte surfaces. The difference in polarizing current density was even greater when the actual surface of the matte side is taken into account; actual surface was 1.8 to 2.4 times that of the polished surface. Differences in cooling are cited as the cause for variations in electrochemical behavior. Deep pits are considered to be the cause for defect formation during polishing. Galvanostatic measurements showed that metal of the first alloy dissolved into 82% H3PO4 + 3% HF 20 to 25% more quickly from the matte side than from the polished side. Author

N85-25506# Joint Publications Research Service, Arlington, Va.
SURFACE COMPOSITION, PROPERTIES AND THERMAL STABILITY OF MASSIVE AND FINE METALLIC GLASSES Abstract Only c27
T. P. Shmyreva, T. I. Bratus, M. A. Vasilyev, N. D. Machuskaya, A. P. Mukhin, and S. I. Nemchinov *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 3 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metally (Moscow), no. 6, Nov. - Dec. 1984 p 86-91 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

Amorphous metallic alloys with their unusual structures and valued technical properties have drawn increased attention. Structural changes, surface composition, corrosion resistance and hardness of thin and massive coatings of Fe-8Cr-2Mn-7P-1B-7C alloy in dependence on annealing temperature are examined. The coatings were produced by tempering on a rapidly revolving disk, for a 30 mcm ribbon, and by detonation gas atomization for a layer approximately 2mm thick. Surface analysis was conducted in an ultrahigh vacuum Auger spectrometer following standard procedures, while potentiodynamic curves were recorded to show corrosion resistance. Results showed that in the initial state at 20 C and after annealing at 200 C, the ribbon had higher corrosion resistance than the thicker layer, but as temperature increased, this situation reversed itself so that the thicker layer became more durable. This is attributed to changes in the surface of the thin ribbon. Differential thermal analysis showed that the alloy was transformed from an amorphous state to a crystalline one at 450 C. Author

N85-25507# Joint Publications Research Service, Arlington, Va.
DETONATION FLAME SPRAYING EXTENDS LIFE OF AUTOMOTIVE PARTS
V. Shvorina *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 6-7 Transl. into ENGLISH from Sots. Industr. (Moscow), 10 Jan. 1985 p 1 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

Flame spraying is used in the automobile industry to solve a technical problem - lengthening the life of domestic automotive parts. The advantages of the use of aluminum oxides are discussed. The life of automotive assemblies strengthened by detonation flame spraying is lengthened more than fivefold. B.G.

N85-25508# Joint Publications Research Service, Arlington, Va.
MECHANISMS OF BUILDUP AND PROPERTIES OF ALUMINUM COATINGS ON HEAT-RESISTANT NICKEL ALLOYS Abstract Only
V. P. Lesnikov, V. P. Kuznetsov, M. V. Kukhtin, Yu. A. Belykh, and Yu. O. Goroshenko *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 8 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Metal. (Moscow), no. 1, Jan. 1985 p 18-21 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

Aluminum coatings were deposited on Zh85K, ZhS6U, and EP539LM heat resistant nickel alloys by the forced circulation of

the carrier gas from a 50 Fe(+) 50 Al powder mixture with NB4Cl and AlCl3 as activators. The process temperature and the saturation time as well as the ratio of reacting surface areas and the composition of the gaseous phase were varied, for a study of the coating formation. The coatings were annealed at 1050 C for 2 h and then cooled in air, prior to metallographic examination including X-ray diffractometry along with weight and hardness measurements. The two known mechanisms of coating buildup were established and further explored. The high activity mechanism involves diffusion of aluminum through the layer of the beta-NiAl phase forming in the process, with all alloying elements congregating in the outer coating layer. The low activity mechanism involves diffusion of nickel through the layer of the beta-NiAl phase, with the refractory alloying elements not reaching the outer coating layer and remaining distributed underneath it. The results indicate the feasibility of regulating the mechanism of coating buildup. Author

N85-25509# Joint Publications Research Service, Arlington, Va.
MODIFIED ALUMINOSILICIDE COATING FOR HEAT-RESISTANT NICKEL ALLOYS Abstract Only
B. N. Guzanov, S. V. Kositsyn, V. P. Kuznetsov, V. G. Sorokin, and N. B. Vandysheva *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 8-9 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Metal. (Moscow), no. 1, Jan. 1985 p 21-23 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

To further improve the already excellent service characteristics of aluminosilicide coatings (26 to 28% Al, 6 to 8% Si) deposited on heat resistant nickel alloys by the thermodiffusion process, a third element was added with a favorable effect on the adhesion characteristics and the morphology of the protective oxide film. This element, a rare earth metal (lanthanum) does not otherwise significantly alter the phase constitution and chemical composition of the coating. The heat resistance in air at 1100 C is increased by approximately 30% and its corrosion resistance in Na2SO4 melt at 950 C by approximately 45%, also inhibiting the degradation of heat and corrosion resistance by repetitive temperature charges. The technology of coating deposition remains the same. According to measurements of thermoluminescence, lanthanum increases its intensity and thus contributes, alongside silicon, to the formation of a dense nonpeeling, oxide film. Author

N85-25510# Joint Publications Research Service, Arlington, Va.
TITANIUM DIFFUSION METHOD PREVENTS METAL CORROSION Abstract Only
N. Aleksandrov and A. Mudrova *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 10 Transl. into ENGLISH from Tekhn. i Nauka (Moscow), no. 1, Jan. 1985 p 5 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

Powders, consisting of titanium or ferrotitanium and activating additives, are used for titanium diffusion saturation of steels, cast irons, and nonferrous alloys. The products are heated in standard electric furnances, without using a protective atmosphere, for four to eight hours up to a temperature of 300 to 1100 C depending on the basic type of metal. As a result of titanium saturation, a diffusion layer that is light gray in color, 1.5 to 5 mm in thickness and well bonded to the protected metal is formed on the steel, cast iron, and copper alloy samples. The strength of samples with a titanium surface is higher by a factor of 10 to 15 than of samples with a non-titanium surface. It is very important that this type of protection does not require preliminary preparation or cleaning of rust and oil spots from the surfaces of details. The corrosion resistance of titanium saturated steels was determined by gravimetric and potentiostatic methods in the sea water of Kola Bay, mineral acid solutions, 30% hydrochloric acid and 20% sulfuric acid solutions, and a copper sulfate solution. Author

N85-25511# Joint Publications Research Service, Arlington, Va.
INHIBITING TITANIUM CORROSION IN HOT NITROGEN NITRATE SOLUTIONS USING SULFATE IONS Abstract Only
A. M. Sedenkov and L. R. Berezovskiy *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 11 Transl. into ENGLISH from Zashchita Metal. (Moscow), v. 21, no. 1, Jan. - Feb. 1985 p 111-112 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

In nitric acid of 15 to 80% concentration at 20 to 160 C, titanium has good corrosion resistance, but at higher temperatures it dissolves rapidly. The inhibiting action of 70% sulfuric acid at 180 C with 0.1% fluoride (by weight) is examined. A radioactive isotope method was used to study adsorption of the H2SO4 onto the titanium. Results indicated that the sulfuric acid markedly reduced the rate of dissolution of the titanium. Gradual removal of the coatings formed on the titanium revealed that the H2SO4 anions adsorbed in a surface layer of approximately 20 nm, making a film about 1 mcm thick. The film in turn slowed dissolution of the titanium in the heated nitric acid. Author

N85-25512# Joint Publications Research Service, Arlington, Va.
CORROSION BEHAVIOR OF Al4 ALUMINUM ALLOY HARDENED BY CO2 LASER RADIATION Abstract Only
B. K. Opara, V. M. Andriyakhin, V. I. Volgin, and V. V. Bandurkin *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 11 Transl. into ENGLISH from Zashchita Metal. (MOscow), v. 21, no. 1, Jan. - Feb. 1985 p 87-89 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

The Al4 alloy, with a composition by weight of 9.5% Si, 0.30% Cu, 0.30% Mg, 0.20% Mn, 0.64% Fe and traces of zinc, is used frequently for complex and important parts that work under great loads, high temperatures and strong gas flows. Ways to increase normal operating life in V-block engines, where practice has shown regular failure of cylinder heads at the intake valves were studied. The cause of failure is traced to electronic effects which break down aluminum more rapidly than adjacent silicon. Test samples were given CO2 laser treatment at 7.5 to 8 MWT/sqm, causing melting to a depth of 1 mm. Other features of the laser process, as well as anode and cathode factors, are discussed. Results showed that as surface movement rate increased (and thus energy input declined), the rate of crystallization, homogeneity of the alloy and Si distribution all grew. A good correlation was noted between anode current flow density and cylinder head durability under test-stand conditions. Author

N85-25513# Joint Publications Research Service, Arlington, Va.
HARDENING OF TITANIUM ALLOY ELECTRIC-ARC WELDED JOINTS Abstract Only
M. A. Khorev *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 27 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Metal. (Moscow), no. 1, Jan. 1985 p 52-54 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

Heat treatment of VT6S, VT14, VT23, VT19 titanium alloy 2-pass electric-arc welded joints was studied, for the purpose of establishing the best hardening process. The three modes of heat treatment were water quenching at rates of 3000 to 3600 C/min, air quenching at rates of 60 to 70 C/min, and quenching in vacuum furnace at rates of 4 to 5 C/min, each quenching followed by aging. The effect on the mechanical properties was evaluated in terms of the increment of ultimate tensile strength, with attendant changes in hardness and toughness. The different optimum modes of heat treatment for the four alloys are predicated on their different phase compositions and by the phase transformations occurring in the process. Quenching generally from the upper temperature limit of the (alpha + beta) phase followed by appropriate aging increases the ultimate tensile strength of VT6S, VT14, VT23, and VT19 welded joints by 200, 250, 300, and 250 MPa to 1100, 1150, 1300, and 1250 MPa, respectively. B.G.

N85-25514# Joint Publications Research Service, Arlington, Va.
MECHANICAL PROPERTIES OF CAST MARTENSITIC HIGH-STRENGTH MULTICOMPONENT TITANIUM ALLOYS Abstract Only

V. N. Moiseyev, Yu. M. Dolzhanskiy, K. K. Yasinskiy, N. N. Cherkasov, and I. A. Prostov *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 28 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Metal. (MOscow), no. 1, Jan. 1985 p 43-45 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

The basic titanium alloy used in aircraft construction is wrought VT22, with an ultimate tensile strength of at least 1100 MPa after annealing, but VT5L and VT20L titanium alloys are more suitable for investment casting. The problem is to increase the tensile strength and the fatigue strength of castable alloys to the VT22 level. Considering that titanium alloys of the Ti-Al-Mo-V+(Sn-Zr-Cu-Fe) system are most likely to meet the requirements, 17 different formulations (1.5 to 2.5% Sn, 2.0 to 4.0% Zr, 0.5 to 1.0% Cu, 0.5 to 1.0% Fe) were processed in a physical-mathematical differential factorial experiment. All specimens were prepared from TG-100 titanium sponge (37.7% Mo, 32.3% V, 16% Ti, 15.8% Al, 0.24% Si) with appropriate additives. The ingots were identically heat treated, and then tested for ultimate tensile strength, toughness, percent elongation, and percent reduction. A correlation between test results and alloy composition was established by regression analysis. Author

N85-25515# Joint Publications Research Service, Arlington, Va.
THERMAL STABILITY OF TITANIUM ALLOYS AFTER COLD PLASTIC DEFORMATION Abstract Only
M. V. Maltsev and T. N. Volkova *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 28-29 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Metal. (Moscow), no. 1, Jan. 1985 p 40-43 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

Titanium (alpha+beta) alloys VT6-pure, VT3-1, VT16, VT30 were studied for the effect of soaking at 300, 400, and 500, C on their mechanical properties and phase composition as well as for the effect of cold plastic deformation on their thermal stability. Each alloy was annealed first (VT6-p: 900 C for 2 h, furnace cooling to 500 C at 3 deg C/min, air cooling; VT3-1: 900 C for 2 h, air cooling to 20 C, 580 C for 3 h air cooling; VT16: 780 C for 2 h, furnace cooling to 200 C at 3 C/min - air cooling; VT30: 680 C for 2 h, furnace cooling to 200 C at 3 C/min - air cooling). X-radiographic analysis of both annealed and strain-hardened specimens reveals that soaking at 300 to 500 C causes changes in the alpha-phase, its enrichment with eutectoidally alloying elements such as chromium and iron being most appreciable at 400 C after a sufficiently long time and intermetallic compounds likely to precipitate under any conditions, while the alpha-phase remains unchanged. With respect to thermal stability after cold plastic deformation, accordingly, these four titanium alloys compare as follows in the order from least to most stable: VT30 - VT16 - VT3-1 - VT6-p. Author

N85-25516# Joint Publications Research Service, Arlington, Va.
DEPENDENCE OF PLASTICITY OF VT1-00 TITANIUM ALLOY ON MICROSTRUCTURE Abstract Only
G. A. Kaybyshev, R. M. Galeyev, and G. A. Salishchev *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 29 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Metal. (Moscow), no. 1, Jan. 1985 p 37-40 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

The VT1-00 alloy was made for the purpose of reconciling contradictory available data on superplasticity within the phase-transformation temperatures range and establishing the dependence of plasticity on the microstructure as well as on the deformation rate-temperature mode. Experiments were performed on technical-grade titanium, first after cold rolling to 50% reduction and then after annealing at 850 C for 30 min. An analysis of the mechanical properties as functions of the temperature over the 500 to 900 C range at various constant temperatures and as functions of the strain rate over the .0001 to .01/s range at various constant temperatures indicates that the dependence of the stress-strain curve on the initial state is significant only within the alpha-phase temperature range, becoming strongest at 600 C. The results are supported by results of microstructural examination including the islocation pattern and the surface relief. While the plasticity was found to be much lower within the phase-transformation temperature range, superplasticity was observed within the alpha-phase temperature range along with dynamic recovery. Author

N85-25517# Joint Publications Research Service, Arlington, Va.
STRUCTURE AND PROPERTIES OF VT20L TITANIUM ALLOY WITH 0.1-0.3 PERCENT CONTENT Abstract Only
L. V. Shlakovskaya, Yu. F. Klimov, and V. V. Lukyanov *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 30 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Metal. (Moscow), no. 1, Jan. 1985 p 35-36 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

The high-quality VT20L titanium alloy (5.6 to 6.3% Al, 1.8 to 2.2% Zr, 1.2 to 1.5% Mo, 1.2 to 1.4% V) contains 0.1 to 3% C impurity when cast from graphite crucible, which can reduce its toughness from above to 0.3 MJ/sq m. to below 0.1 MJ/sq. m. A preliminary examination has revealed the presence of globular sigma-phase inclusions, solid solution of titanium in TiC, mainly along the axes of dendrites and boundaries of the defunct beta-phase. Assuming that a higher solubility of carbon in the alpha-phase will contribute to dissolution of these inclusions, secondary annealing after the first diffusion annealing was proposed as a way to restore the toughness of this alloy without reduction of its tensile strength. Diffusion alloying for 3 to 5 h at 750 to 1100 C has revealed that 1050 C is the critical temperature above which the beta-phase will form again and 900 to 1000 C is the most favorable range for dissolving the sigma-phase. Secondary annealing for 3 h at 300 to 850 C, depending on the carbon content, with subsequent air cooling, has revealed that it has no effect on the alloy with less than 0.2% C. Author

N85-25518# Joint Publications Research Service, Arlington, Va.
EFFECT OF INITIAL STRUCTURE ON TEXTURE OF PRESSED TITANIUM ALLOY BARS Abstract Only
S. V. Grebenkin, A. M. Dekun, A. S. Shishmakov, and R. A. Ademesky *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 30-31 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metally (Moscow), no. 5, Sep. - Oct. 1984 p 133-138 Original language document was announced in IAA as A85-12935 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

Experimental results for pseudo-alpha (OT4 and VT20) and alpha + beta (VT3-1) titanium alloys indicate that the initial structure has no effect on the type of texture formed during the extrusion of bars. The only difference is the intensity of individual components, which is higher in bars obtained from alloys with a finely dispersed structure. The formation of a multicomponent texture in VT20 and VT3-1 alloys is associated with the effect of deformation and recrystallization processes and also with the phase transformation during cooling. In OT4 alloy, however, the formation of the texture is largely determined by the deformation of the alpha phase. The formation of a strong 0001-line-alpha component along the bar axis in VT20 and VT3-1 alloys leads to an increase in their strength characteristics. V.L. (IAA)

N85-25519# Joint Publications Research Service, Arlington, Va.
ANODE FORMATION OF PASSIVATING FILMS ON TITANIUM ALLOY AT TEMPERATURES UP TO 200 DEG C Abstract Only
Yu. B. Kamenev, N. Yu. Lyzlov, and A. A. Nazarov *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 32-33 Transl. into ENGLISH from Zashchita Metal. (Moscow), v. 21, no. 1, Jan. - Feb. 1985 p 113-116 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

A condition always associated with corrosion cracking is localization of the anode process in the crack surface, which is

N85-25522# New South Wales Univ., Kensington (Australia). School of Metallurgy.
THE INFLUENCE OF ABRASIVE BLAST CLEANING AND CORROSION INHIBITORS ON PROTECTIVE PAINT COATINGS M.S. Thesis. Abstract Only
A. R. Arney 1984 3 p
Avail: NTIS HC A02/MF A01

Wet blast cleaning of steel surfaces results in flash rusting and to combat this problem, water soluble inhibitors are used. It was suggested that inhibitors could be improved and to investigate this problem, it was necessary to produce abrasive blast cleaned surfaces of constant quality with an optimum substrate on which to test the inhibitors. The abrasive blast cleaning of steel surfaces were studied. From the literature, related to the erosion of ductile

possible only with stable passivation of the side walls. In that connection, the mechanism of formation of passivating films on TS-5 titanium alloy films in a solution of NaCl (0.7 M) at 298 to 473 K was studied. The electrode was positioned so that only its polished face was exposed. A special three-electrode cell permitted electrochemical measurements; the auxiliary electrode was of platinum and the standard electrode of saturated silver chloride. Current/time curves were made at 298, 323, 373, 423 and 473 K. Calculations and formulas for assessing the results are presented. The data showed that at low temperatures little increase in film surface occurred. The independence of current from time at higher temperatures confirmed a degree of stabilization of the oxide layer. The conclusion was that as temperature increased, the passivation of the alloy was retarded due to accelerated chemical dissolution of the oxide layer. Author

N85-25396# Joint Publications Research Service, Arlington, Va.
EFFECT OF DEEP COOLING ON CRACK RESISTANCE AND LOW-TEMPERATURE HARDENING OF ALUMINUM ALLOYS Abstract Only
G. S. Pisarenko, V. A. Strizhalo, O. Ya. Znachkovskiy, and L. S. Novogrudskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 1 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 11, Nov. 1984 p 27-32 Original language document was announced in IAA as A85-16906 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25397# Joint Publications Research Service, Arlington, Va.
FATIGUE OF CLAD ALUMINUM MATERIALS D16T AND 2024-T3 WITH STEPPED LOADING Abstract Only
M. Iustern, Mambve, and A. I. Radchenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 2 Transl. into ENGLISH from Fiz.-Khim. Mekhan. Mater. (Kiev), v. 20, no. 6, Nov. - Dec. 1984 p 87-88 Original language document was announced in IAA as A85-24044 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25398# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF SYMMETRY OF IMMEDIATE SURROUNDINGS IN AMORPHOUS Co-P ALLOYS Abstract Only
R. S. Ishakov, G. I. Fish, V. K. Maltsev, and R. G. Khebopros *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 3 Transl. into ENGLISH from Fiz. Met. i Metalloved. (USSR), v. 58, no. 6, Dec. 1984 p 1214-1215 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25399# Joint Publications Research Service, Arlington, Va.
TEMPERATURE VARIATION OF RESISTIVITY OF CERTAIN ALLOYS BASED ON TRANSITION AND SIMPLE METALS IN AMORPHOUS AND CRYSTALLINE STATES Abstract Only
S. G. Gumbatov, G. Kh. Panova, and A. A. Shikov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 5 Transl. into ENGLISH from Fiz. Met. i Metalloved. (USSR), v. 58, no. 2, Aug. 1984 p 292-297 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25400# Joint Publications Research Service, Arlington, Va.
CONVERSIONS IN AMORPHOUS ZIRCONIUM-VANADIUM ALLOY Abstract Only
Yu. V. Barmin, V. V. Vavilov, L. N. Galkin, I. V. Zolotukhin, Yu. K. Kovneristyy, and G. I. Ruda *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 6 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 278, no. 2, Sep. 1984 p 348-350 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25401# Joint Publications Research Service, Arlington, Va.
STRUCTURE AND AGING OF AMORPHOUS CHROMIUM-GERMANIUM ALLOYS Abstract Only
Yu. I. Maslennikov and N. P. Sudakova *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 6-7 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Neorgan. Mater. (Moscow), v. 20, no. 11 p 1834-1838 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25402# Joint Publications Research Service, Arlington, Va.
STUDY OF AMORPHOUS STRIPS AND MICROCONDUCTORS BY FERROMAGNETIC RESONANCE METHOD Abstract Only
V. S. Pokatilov, S. V. Kapelnitskiy, V. P. Ovcharov, B. N. Kulagin, and L. K. Zakharova *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 7-8 Transl. into ENGLISH from Fiz. Met. i Metalloved. (USSR), v. 58, no. 6, Dec. 1984 p 1144-1147 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25406# Joint Publications Research Service, Arlington, Va.
POWDER METALLURGY PRODUCTION PROBLEMS Abstract Only
S. Kiparisov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 27-29 Transl. into ENGLISH from Izv. (Moscow), 15 Jan. 1985 p 2 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25407# Joint Publications Research Service, Arlington, Va.
FATIGUE STRENGTH OF ALPHA-TITANIUM ALLOYS UNDER COPHASAL ACTION OF VARIABLE NORMAL AND TANGENTIAL STRESSES Abstract Only
Yu. A. Shamanin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 38 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 12, Dec. 1984 p 26-27 Original language document was announced in IAA as A85-19980 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25408# Joint Publications Research Service, Arlington, Va.
STUDY OF STRUCTURAL CHANGES OF DUAL-PHASE TITANIUM ALLOY DURING SHOCK WAVE LOADING Abstract Only
Yu. N. Petrov, G. N. Nadezhdin, V. L. Svechnikov, and V. V. Astanin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 39 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 12, Dec. 1984 p 29-33 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25409# Joint Publications Research Service, Arlington, Va.
POSSIBLE USE OF RAPID HEATING FOR IMPROVING MECHANICAL PROPERTIES OF TITANIUM ALLOYS Abstract Only
L. A. Yelagina, A. I. Gordiyenko, M. Ya. Brun, and V. V. Ivashko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 39-40 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Met. (Moscow), no. 12, Dec. 1984 p 32-36 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25410# Joint Publications Research Service, Arlington, Va.
EFFECT OF ANNEALING PROCEDURES ON STRUCTURE AND PROPERTIES OF VT6 ALLOY WITH INITIAL LARGE-GRAINED STRUCTURE Abstract Only
L. S. Krasnoyartseva, V. S. Lyasotskaya, and O. A. Mozolevskaya *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 40 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Met. (Moscow), no. 12, Dec. 1984 p 36-39 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25411# Joint Publications Research Service, Arlington, Va.
EFFECT OF ALUMINUM ON NATURE OF TITANIUM ALLOY FAILURE Abstract Only
A. A. Popov and L. I. Anisimova *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 41 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Met. (Moscow), no. 12, Dec. 1984 p 40-43 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25412# Joint Publications Research Service, Arlington, Va.
STUDY OF OXIDIZED SURFACE COATING ON TITANIUM AFTER ANNEALING Abstract Only
V. V. Peshkov and V. N. Milyutin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 41-42 Transl. into ENGLISH from Metalloved. i Term. Obrabotka Met. (Moscow), no. 12, Dec. 1984 p 43-45 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25413# Joint Publications Research Service, Arlington, Va.
RESISTANCE OF HYDROGENATED ALPHA-TITANIUM ALLOYS TO CORROSION-FATIGUE FRACTURE Abstract Only
V. I. Syshchikov, P. Ya. Sidor, Yu. I. Babey, G. I. Ivanyukhina, and M. D. Klakiv *In its* USSR Rept.: Mater. Sci and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 43 Transl. into ENGLISH from Fiz.-Khim. Mekhan. Mater. (Kiev), v. 20, no. 5, Sep. - Oct. 1984 p 117-118 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25414# Joint Publications Research Service, Arlington, Va.
HYDROGEN RESISTANCE OF VT1-0 TITANIUM UNDER 150 MPa PRESSURE AT ROOM TEMPERATURE Abstract Only
Yu. I. Archakov, T. D. Aleferenko, and Yu. V. Telegin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 43-44 Transl. into ENGLISH from Fiz.-Khim. Mekhan. Mater. (Kiev), v. 20, no. 5, Sep. - Oct. 1984 p 118-119 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25415# Joint Publications Research Service, Arlington, Va.
STRUCTURAL CHANGES WITH ONE- AND TWO-STAGE AGING OF ALLOYS Ti-Al-Mo-Fe AND Ti-Zr-V-Al-Sn Abstract Only
V. B. Vasilyeva and M. I. Zakharova *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 44 Transl. into ENGLISH from Fiz. Met. i Metalloved. (USSR), v. 58, no. 6, Dec. 1984 p 1188-1193 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25432# Joint Publications Research Service, Arlington, Va.
EFFECT OF PROTECTIVE ATMOSPHERE COMPOSITION ON DURABILITY OF WELDED JOINTS OF NIOBIUM ALLOYS Abstract Only
M. D. Rabkina, M. M. Nerodenko, S. M. Gurevich, E. S. Umanskiy, V. K. Kharchenko, V. V. Krivenyuk, G. E. Cholovskiy, G. D. Petrunin, and N. F. Chugay *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 64 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 11, Nov. 1984 p 112-118 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25610# Joint Publications Research Service, Arlington, Va.
SWEDEN DEVELOPS NEW RAPID SOLIDIFICATION PROCESS
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-006) 29 Feb. 1984 p 13-16 Transl. into ENGLISH from Teknik i Tiden (Stockholm), Autumn 1983 p 12-13 (For primary document see N85-25606 15-31)
Avail: NTIS HC A04/MF A01

N85-25611# Joint Publications Research Service, Arlington, Va.
FRANCE DEVELOPS NEW CONTINUOUS VACUUM TREATMENT METHOD
Jean Nenin *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-008) 29 Feb. 1984 p 17-19 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 26 Jan. 1984 p 72-73 (For primary document see N85-25606 15-31)
Avail: NTIS HC A04/MF A01

N85-25626# Joint Publications Research Service, Arlington, Va.
TITANIUM ALLOYS, PRODUCTS, STANDARDS LISTED
Stanislaw Ksiazek *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 3-8 Transl. into ENGLISH from Technika Lotnicza i Astronautyczna (Warsaw), no. 3, Mar. 1984 p 22-23 (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N85-25520*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CRYSTALLINITY DETERMINATION BY CURVEFIT PROCEDURE FOR A SEMI-CRYSTALLINE POLYMER
N. T. Wakelyn May 1985 35 p refs
(NASA-TM-86412; NAS 1.15:86412) Avail: NTIS HC A03/MF A01 CSCL 11B

Wide angle X-ray scattering (WAXS) data from poly (etheretherketone) (PEEK) was resolved into a crystalline contribution represented as four reflections and an amorphous contribution represented as a broad, smoothly varying curve. The crystalline scatter is described as a linear combination of Cauchy and Gaussian functions while that of the amorphous halo is expressed as a cubic polynomial. Statistical analysis of the measured scattered intensity from an amorphous specimen with that calculated from the cubic polynomial, as a function of the combination parameter (fraction of Cauchy and Gaussian functions), suggests that the crystalline fraction of the polymer specimen studied is about 0.39. E.A.K.

N85-25521*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HOMOGENEITY OF PRISTINE AND BROMINE INTERCALATED GRAPHITE FIBERS
J. R. Gaier and D. Marino 1985 16 p refs Presented at the 17th Bien. Conf. on Carbon, Lexington, Ky.; sponsored by the American Carbon Society
(NASA-TM-87016; E-2560; NAS 1.15:87016) Avail: NTIS HC A02/MF A01 CSCL 11G

Wide variations in the resistivity of intercalated graphite fibers and to use these materials for electrical applications, their bulk properties must be established. The homogeneity of the diameter, the resistivity, and the mass density of 50 graphite fibers, before and after bromine intercalation was measured. Upon intercalation the diameter was found to expand by about 5%, the resistivity to decrease by a factor of five, and the density to increase by about 6%. Each individual fiber was found to have uniform diameter and resistivity over macroscopic regions for lengths as long as 7 cm. The ratio of pristine to intercalated resistivity increases as the pristine fiber diameter increases at a rate of 0.16 micron, but decreases with the increasing ratio of intercalated diameter to pristine diameter at a rate of 0.08. E.A.K.

metals, it was established that three variables govern the abrasive cleaning of the steel, namely: (1) particle size; (2) particle velocity; and (3) angle of particle impingement. These three variables were studied using a small scale dry blasting unit to clean a corroded sheet. After sectioning and edge mounting, the surfaces produced were microscopically examined. It was found that although the particle size and velocity influences the size and shape of the entrapped corrosion pockets, the angle of particle impingement was the major factor governing the quantity of contamination retained in the surface. Author

N85-25523*# Springborn Labs., Inc., Enfield, Conn. Dept. of Analytical Chemistry.
DEVELOPMENT OF ACCEPTANCE CRITERIA FOR BATCHES OF SILANE PRIMER FOR EXTERNAL TANK THERMAL PROTECTION SYSTEM BONDING APPLICATIONS Progress Report, 6 Jan. - Mar. 1985
F. Mikes 11 Apr. 1985 25 p
(Contract NAS8-35818)
(NASA-CR-171436; NAS 1.26:171436; PR-10) Avail: NTIS HC A02/MF A01 CSCL 11G

Fourier transform infrared spectroscopy is currently the best technique for observing hydrolytic changes in DC 1200 silane the primers caused by moisture in the atmosphere. To further prove that FTIR can be used as a criterion test for acceptance of silane primer lots, intensities of the FTIR OH- band are being compared with primer adhesive bond strength using a mechanical test suggested by NASA. Results of tests for shear strength and Oh-absorption are tabulated and compared with FTIR absorption intensities in the OH-region. A.R.H.

N85-25524# North Carolina Univ., Chapel Hill. Dept. of Statistics.
A STATISTICAL APPROACH TO RELAXATION IN GLASSY MATERIALS
K. Weron (Wroclaw Univ., Poland) and A. Weron Nov. 1984 21 p
(Contract F49620-82-C-0009)
(AD-A151285; TR-82) Avail: NTIS HC A02/MF A01 CSCL 11/2

Statistical aspects of the Williams-Watts relaxation model are derived explicity from the limit theorem in probability theory. It is shown that the relaxation rate distribution is governed by completely asymmetric Levy alpha-stable distributions, $0 < \text{alpha} < 1$. This gives a rigorous approach to the stretched exponential form of relaxation function and also relates the effective relaxation time to the primitive relaxation time. It is demonstrated how useful is the technique of Levy alpha-stable distributions in the study of relaxation phenomena which complements the recent works of Montroll-Bendler and Montroll-Shlesinger. GRA

N85-25525# Michigan Univ., Ann Arbor.
TRANSFORMATION TOUGHENED CERAMICS: A POTENTIAL MATERIAL FOR LIGHT DIESEL ENGINE APPLICATIONS Final Report, 1 Oct. 1982 - 30 Sep. 1983
T. Y. Tien Jun. 1984 54 p
(Contract DAAG46-82-C-0080)
(AD-A151413; AMMRC-TR-84-26) Avail: NTIS HC A04/MF A01 CSCL 11/2

This report contains three parts: The thermal conductivity studies in the system Al2O3-Cr2O3-ZrO2-HrO2 are presented in the first part. The mechanical behavior of these compositions will be presented in the second part. The mullite - Zr02 system will be discussed in the third part. The results indicate that a composition containing 15 mole % of Cr203 in Al203 in the matrix phase has a thermal conductivity comparable to that of stabilized zirconia. GRA

N85-25526# Michigan Univ., Ann Arbor. Dept. of Materials and Metallurgical Engineering.
TRANSFORMATION TOUGHENED CERAMICS: A POTENTIAL MATERIAL FOR LIGHT DIESEL ENGINE APPLICATION Semiannual Report, 1 Oct. 1983 - 31 Mar. 1984
T. Y. Tien Jun. 1984 62 p
(Contracts DAAG46-84-K-0001; DE-A101-77CS51017)
(AD-A151421; AMMRC-TR-84-46) Avail: NTIS HC A04/MF A01 CSCL 11/2

This report contains three parts: The mechanical behavior of the composites in the system Al203:Cr203/Zr02:Hf02 are presented in the first part. The thermal conductivity studies of these compositions will be presented in the second part. The mullite - Zr02 system will be discussed in the third part. The results indicate that a composition containing 15 mole % of the Cr203 in the matrix phase has a thermal conductivity comparable to that of stabilized zirconia. Composites heat treated at 900 and 1200 C for 400 hours showed no degradation in mechanical properties. GRA

N85-25527# Massachusetts Univ., Amherst. Dept. of Chemistry.
A SOLUBLE LINEAR SCHIFF-BASE COORDINATION POLYMER CONTAINING EIGHT-COORDINATE ZIRCONIUM(4) Interim Report
R. D. Archer, M. L. Illingsworth, D. N. Rau, and C. J. Hardiman Feb. 1985 30 p
(Contract N00014-81-K-0611)
(AD-A151446; TR-6) Avail: NTIS HC A03/MF A01 CSCL 07/3

The first soluble linear Schiff-base heavy metal coordination polymer has been synthesized via the condensation of 1,2,4,5-tetraaminobenzene and tetrakis(salicylaldehydato)zirconium(IV) in dry dimethyl sulfoxide. The N,N',N'',N'''-tetrasalicylidene-1,2,4,5-tetraaminobenzeneatozir conium (IV) polymer has a number average molecular weight of up to 49,000 based on inherent viscosity, geli permeation chromatography, and element analysis. Spectra properties of this polymer indicate a structure analogous to the model compound, bis(N,N'-disalicylidene-1,2-phenylenediamino)zirconium (IV). Thermal characterization of the polymer is also discussed. GRA

N85-25528# Notre Dame Univ., Ind. Dept. of Chemical Engineering.
SEPARATING POLYMER SOLUTIONS USING HIGH PRESSURE LCST LOWER CRITICAL SOLUTION TEMPERATURE) PHENOMENA Interim Technical Report, 1 Jul. 1983 - 30 Jun. 1984
A. K. McClellan and M. A. McHugh 30 Oct. 1984 24 p
(Contract N00014-83-K-0613)
(AD-A151538; TR-1) Avail: NTIS HC A02/MF A01 CSCL 11/9

A lower critical solution temperature (LCST) phase split can be used as an alternative to steam stripping for separating polymer solutions. By adding a supercritical fluid (SCF) additive to the polymer solution the LCST can be lowered, thus, minimizing the possibility of polymer degradation and also reducing the thermal energy requirements for the process. Experimental results for the poly(ethylene-co-propylene)-hexane-SCF ethylene system are shown as an example of the type of phase behavior observed with polymer-solvent - SCF additive solutions. Adding 20% (w/w) ethylene to the polymer solution lowers the temperature of the LCST by 109 C. The addition of 30% (w/w) ethylene to the polymer solution lowers the temperature of the LCST curve sufficiently to merge this curve with the UCST curve. When the lower critical end point (LCEP) is plotted against the critical temperature of the solvent the data for poly(ethylene-co-propylene) - solvent systems are well represented by a single curve. A more fundamental modelling approach is needed to estimate the pressure of the LCEP and the concentration of SCF additive necessary to merge the LCST and the UCST curves. Patterson's theory of corresponding states can be used for these calculations. GRA

N85-25529# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE EFFECTS OF WATER AND HYDROGEN ON MATERIALS USED IN INTEGRATED CIRCUIT PACKAGES M.S. Thesis
M. W. Prairie Dec. 1984 113 p
(AD-A151893; AFIT/GE/ENG/84D-51) Avail: NTIS HC A06/MF A01 CSCL 11/9

This investigation determined the adsorption properties of water

on RC-5878 polyimide, rolled gold foil, and rolled nickel foil at 20 C, as well as the effects that hydrogen has on nickel foil with a monolayer coverage of water molecules. Adsorption isotherms were obtained using a vacuum ultramicrobalance with a sensibility of 0.1 micrograms per 10 gram load. The microbalance system includes a gas handling system, a stainless steel housing, and a quadrupole residual gas analyzer. The isotherms were analyzed using the B. E. T. surface area technique. The results showed that RC-5878 polyimide adsorbs water in an amount proportional to the thickness of the sample when the given cure is used. The rolled gold foil showed no mass gain from water absorption. The nickel foil adsorbed water on 0.86 sq cm of the 210 sq cm sample, and absorbed on 0.40 sq cm during the second run of the experiment. An Auger scan revealed a large concentration of oxygen due to nickel oxide which acted as a passivation layer for the remaining nickel sample surface. A monolayer of water molecules was obtained on the nickel surface, and hydrogen was admitted to the system. The sample exhibited a mass gain which was attributed to hydrogen bonding on the nickel oxide surface. GRA

N85-25530# California Univ., Berkeley. Dept. of Materials Science and Mineral Engineering.

MECHANICAL ASPECTS OF INTERFACES AND SURFACES IN CERAMIC CONTAINING SYSTEMS Annual Report, 1 Jan. - 31 Dec. 1984

A. G. Evans, Z. B. Ahmad, P. W. R. Beaumont, E. D. Case, and M. D. Drory 14 Dec. 1984 410 p

(Contract N00014-81-K-0362)

(AD-A151978) Avail: NTIS HC A18/MF A01 CSCL 20/11

The mechanical behavior of various multicomponent materials have been investigated. The systems studied include ceramic matrix composites, metal/ceramic bonded systems and polymer particulate composites. Experimental observations of fracture behavior have been used to develop criteria that identify the fracture parameters pertinent to structural design. For example, the matrix cracking strength and the ultimate tensile strength have emerged as important parameters in ceramic composite failure. Micromechanics models of mechanical behaviors have also been developed, whenever experimental knowledge sufficiently characterizes the important physical features. Matrix cracking in composites and edge effects in metal/ceramic bonded systems are examples of phenomena that have been comprehensively modelled. GRA

N85-25531# College of the Holy Cross, Worcester, Mass.

CHAIN DYNAMICS AND STRUCTURE PROPERTY RELATION IN HIGH IMPACT STRENGTH POLYCARBONATE PLASTIC Final Report, 15 Nov. 1981 - 14 Nov. 1984

P. T. Inglefield and A. A. Jones 4 Jan. 1985 100 p

(Grant DAAG29-82-G-0001)

(AD-A152011; ARO-18501.7-CH-H) Avail: NTIS HC A05/MF A01 CSCL 11/9

A study of chain dynamics in the solid state of the high impact resistant polycarbonate of bisphenol-A and structural analogues is carried out using nuclear magnetic resonance methods. The object is to quantitatively characterize both the structural geometry and the energetics of local motions occurring in these glassy polymers. It is the belief that only through a detailed knowledge of the solid state dynamics can one establish the structural origin of the bulk properties of these materials. It is important that such a study yield a direct connection to the dynamical mechanical properties which form the basis for characterization of high impact materials. One of the first quantitative demonstrations of this connection is noted in this study. The selection of NMR to probe structure and dynamics in the solid state is well established and the present study focuses on both lineshape and relaxation time analysis using both carbon-13 and deuterium as probes. The study clearly reveals the strengths and weaknesses of the various NMR approaches. GRA

N85-25532# Naval Postgraduate School, Monterey, Calif.

COMPRESSIVE STRENGTH OF EPOXY RESIN CHOCKS SUBJECTED TO ELEVATED TEMPERATURES M.S. Thesis

R. P. Prince Sep. 1984 75 p

(AD-A152018) Avail: NTIS HC A04/MF A01 CSCL 13/13

Epoxy resin chock specimens were molded from Philadelphia Resins Corporation's product CHOCKFAST ORANGE. The 2 x 2 x 1 1/4 chocks were divided into seven groups of 12 specimens each and subjected to the temperature environments of 21.5 C, 40 C, 80 C, 100 C, 120 C, 160 C, and 200 C respectively. A single furnance was used to create the proper environment for each elevated temperature group and equal amounts of specimens were removed at regular intervals up to 1230 hour maximum exposure. The specimens were allowed to cool to ambient conditions and then placed under compressive loading. Stress versus strain plots revealed increased ultimate compressive strengths but decreased moduli of elasticity for each elevated temperature group. GRA

N85-25533# California Univ., Livermore. Lawrence Livermore Lab.

DAMAGE DEVELOPMENT DURING LOW CYCLE FATIGUE OF CARBON-BLACK LOADED SBR

Donald Lesuer, Alfred Goldberg, David Hiromoto, and Jacob Patt (Army Tank-Automotive Command, Warren, Mich.) 18 Jun. 1984 29 p refs Presented at the 8th Inter-Am. Conf. on Mater. Technol., San Juan, Puerto Rico, 25-29 Jun. 1984

(Contract W-7405-eng-48)

(DE85-006234; UCRL-90919; CONF-8406138-2) Avail: NTIS HC A03/MF A01

The problem of damage accumulation in a series of styrene butadiene rubber (SBR) based compounds containing 0, 15, 25, and 35 wt % carbon-black under conditions in which a limited number of higher stress cycles were applied to the material (referred to here as low cycle fatigue) is discussed. Damage development in elastomers can take many forms. Generally speaking, one can classify the degradation as mechanical or chemical in origin. The most obvious form of mechanical damage is flaw or cut growth, while typical examples of chemical damage include chain scission or thermal oxidation. The fatigue crack growth relationship given in Equation 1 obviously only applies to flaw growth. However, it does an excellent job of following the data and exhibits the threshold behavior observed in both SBR and SBR-35 at room temperature. At higher temperatures, the damaged material shows an increasing deviation from threshold behavior. The obvious implication is that some thermally activated damage mechanism is degrading the material. In previous work, carbon-black loaded SBR subjected to a high temperature, high stress environment was shown to undergo a thermal-mechanical oxidation process. Certainly, this process is a candidate for a damage mechanism in these studies. DOE

N85-25534# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.

INTERFACIAL AND COLLOIDAL ASPECTS OF AQUEOUS SUSPENSION CONTAINING OXIDIC POWDERS Final Report

A. Bleier 1984 7 p refs

(Contract DE-AC02-81ER-10953)

(DE85-005972; DOE/ER-10953/T1) Avail: NTIS HC A02/MF A01

Ceramics and colloid science research needs were addressed which underscore the physicochemical principles which govern the processing of oxide ceramic powders. Materials systems emphasized silica, alumina, zirconia, and mullite. The surface charge characteristics of the cited solids were determined using potentiometric techniques. Interfacial chemical reactions were thermodynamically evaluated. Zeta potential trends and values for silica and alumina systems were predicted. Some surface behavior of mullite could be predicted from the constituent, silicon and aluminum oxides. Guidelines were generated for these problems and for a more complete description of the electrical double layers surrounding oxide ceramic powders in aqueous media. It is indicated that charge regulation is important to the processing of ceramics. A charge regulation model suggests that the electrostatic stabilizing effect of surface charge may critically depend on the volume concentration of powder. DOE

N85-25535# Rockwell International Science Center, Thousand Oaks, Calif.
SINTERING PHENOMENA OF NON-OXIDE SILICON COMPOUNDS Final Report, 1 Jul. 1978 - 10 Jun. 1984
Fred F. Lange, T. M. Shaw, and P. E. D. Morgan Dec. 1984 108 p refs
(Contract DE-AC03-78ER-01885)
(DE85-006676; DOE/ER-01885/T6) Avail: NTIS HC A06/MF A01

The chemistry of Si/Cl, Si/I, Si/S was utilized to discover new routes to Si3N4 powder. The interactions that occur between silicon nitride particles and hydroxide precipitates were investigated using electrophoresis measurements. A method for producing uniform mixtures of silicon nitride powders and additive precipitates was formulated and used to produce green compacts of improved compositional homogeneity. The effect of the mixing process on the sintering and slipcasting of silicon nitride green compacts was investigated. A two dimensional model was used to calculate the energy of an array of three cylindrical particles connected by liquid menisci. Examination of the change in energy of the array when the angle between the particle contacts is changed shows that once the liquid menisci at adjacent necks coalesce a torque closing the angle between the contacts arises. Calculations of the effect of the volume of liquid and the wetting angle on the rearrangement forces are used to explain the trends in densification by particle rearrangement observed during liquid phase sintering. E.A.K.

N85-25536# Oak Ridge National Lab., Tenn.
FABRICATION OF FIBER REINFORCED CERAMIC COMPOSITES BY CHEMICAL VAPOR INFILTRATION
A. J. Caputo and W. J. Lackey 1984 28 p refs Presented at the Conf. on Composites and Advan. Ceram. Mater., Cocoa Beach, Fla., 16 Jan. 1984
(Contract DE-AC05-84CR-21400)
(DE85-007565; CONF-840171-2-Draft) Avail: NTIS HC A03/MF A01

Ceramic fiber-ceramic matrix composites were prepared using the chemical vapor deposition (CVD) process. The major goal of significantly reducing the infiltration times was accomplished. A process was conceived, hardware fabricated, and demonstrated on a laboratory scale a process which permits CVD infiltration of an SiC fibrous preform with either and Si3N4 or SiC matrix in 2 to 12 h. The process should be applicable to infiltration of fibrous preforms prepared by slurry molding, stacking of layers of cloth, or filament winding. Two types of composites (SiC-Si3N4 and SiC-SiC) have been produced at densities of about 2.0 Mg/m(3) which was near the desired range. A scheme has also been conceived whereby the new infiltration process could be used for fabrication of tubes or hollow cylinders. This is an important advance since the ability to fabricate tubes or hollow cylinders would offer the hope that the process could be used for fabrication of toughened, high-strength heat exchanger tubes, heat engine cylinder liners and valve guides. DOE

N85-25537# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
PROCEDURE FOR CERTIFYING QUANTITY OF VOLATILE ORGANIC COMPOUNDS EMITTED BY PAINT, INK AND OTHER COATINGS
Dec. 1984 25 p refs
(PB85-159044; EPA-450/3-84-019) Avail: NTIS HC A02/MF A01 CSCL 11C

This manual provides procedures by which firms may voluntarily certify the quantity of volatile organic compounds which will be emitted by a paint, ink, or other coating. Two data sheets are provided, one to be used by the manufacturer of the coating, the other by the user. Analytical test methods and procedures for preparing the data sheets are included, as are the equations and instructions necessary to convert the analytical results into a format suitable for determining compliance with State or Federal regulations. GRA

N85-25403# Joint Publications Research Service, Arlington, Va.
OUTLOOK FOR POLYMER COMPOSITE MATERIALS Abstract Only
Yuriy Sergeyevich Lipatov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Apr. 1985 p 12-16 Transl. into ENGLISH from Krasnaya Zvezda (Moscow), 8 Dec. 1984 p 3-4 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25634# Joint Publications Research Service, Arlington, Va.
GLASS, CARBON FIBERS MADE AT FIBRE ET MICA IN FRANCE
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-020) 18 Jun. 1984 p 3-5 Transl. into ENGLISH from Ind. et Tech. (Paris), 10 Apr. 1984 p 34-35 (For primary document see N85-25633 15-31)
Avail: NTIS HC A05/MF A01

N85-25636# Joint Publications Research Service, Arlington, Va.
FRANCE DEVELOPS OWN ALUMINUM-BASED COMPOSITE CERAMIC
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-003) 16 Jan. 1984 p 1-2 Transl. into ENGLISH from Ind. & Tech. (Paris), 1 Sep. 1984 p 9-10 (For primary document see N85-25635 15-31)
Avail: NTIS HC A04/MF A01

N85-25637# Joint Publications Research Service, Arlington, Va.
FIAT CONDUCTS R AND D IN CERAMIC PARTS FOR DIESEL ENGINE
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-003) 16 Jan. 1984 p 3-5 Transl. into ENGLISH from Sci. e Vita (Milan), Jun. 1983 p 100 (For primary document see N85-25635 15-31)
Avail: NTIS HC A04/MF A01

N85-25645# Joint Publications Research Service, Arlington, Va.
SWEDEN INVENTS NEW CERAMIC FOR MORE DURABLE CUTTING TOOLS
Lars Pekka *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-010) 27 Mar. 1985 p 1-2 refs Transl. into ENGLISH from Ny Tek. (Stockholm), 15 Dec. 1983 p 27 (For primary document see N85-25644 15-31)
Avail: NTIS HC A04/MF A01

N85-25648# Joint Publications Research Service, Arlington, Va.
NEW MATERIAL, PROCESS SPINS OFF FROM VOLVO LCP 2000 PROGRAM
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-014) 4 May 1984 p 1-3 Transl. into ENGLISH from Plastforum Scandinavia (Helsinborg), No. 1/2, 1984 p 46-47 (For primary document see N85-25647 15-31)
Avail: NTIS HC A04/MF A01

N85-25506# Joint Publications Research Service, Arlington, Va.
SURFACE COMPOSITION, PROPERTIES AND THERMAL STABILITY OF MASSIVE AND FINE METALLIC GLASSES Abstract Only
T. P. Shmyreva, T. I. Bratus, M. A. Vasilyev, N. D. Machuskaya, A. P. Mukhin, and S. I. Nemchinov *In its* USSR Rept.: Mater. Sci. and Metallurgy (JPRS-UMS-85-004) 6 May 1985 p 3 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metally (Moscow), no. 6, Nov. - Dec. 1984 p 86-91 (For primary document see N85-25503 15-26)
Avail: NTIS HC A04/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N85-25538# National Aerospace Lab., Tokyo (Japan). Aircraft Noise and Emission Research Group.
LIMITING FACTOR OF FLAME PROPAGATION IN MONO-SIZED SPRAYS OF LOW-VOLATILITY FUELS
Shigeru Hayashi Oct. 1984 15 p refs
(NAL-TR-839T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The propagation limits in monosized sprays have been measured for n decane over the droplet size range from 40 to 140 micro m and n dodecane from 40 to 160 micro m. The limits are expressed in terms of the number density or spacing of droplets as well as the fuel concentration. With increasing droplet size, the critical value for flame propagation of number density decreases sharply but that of spacing increases at a very small rate. It is found that the critical fuel concentration decreases drastically as droplet size changes from a few microns to about 40 micro m, then decreases moderately towards less than half of the limit of inflammability of a premixed gas mixture of the same fuel. This reduction is attributed to the transition, of the mechanism of ignition from the normal continuous ignition to the relay ignition of the neighboring droplets. The effect of fuel volatility is detected. Author

N85-25539# Ashland Petroleum Co., Ky.
AVIATION TURBINE FUELS FROM TAR SANDS BITUMEN AND HEAVY OILS. PART 1: PROCESS ANALYSIS Interim Technical Report, 1 Jul. 1983 - 31 Mar. 1984
H. F. Moore, C. A. Johnson, W. A. Sutton, L. M. Henton, and M. H. Chaffin Wright-Patterson AFB, Ohio AFWAL Sep. 1984 159 p
(Contract F33615-83-C-2301)
(AD-A151319; AFWAL-TR-84-2070-Pt-1) Avail: NTIS HC A08/MF A01 CSCL 21/4

Phase I work performed was directed toward defining the United States tar sands and heavy oil resources by a literature survey and the development of a preferred processing route that would produce quantities of JP4 and JP8 at optimum operating conditions attaining at least 70% energy efficiency and limiting coke and residual products to less than 10 percent. The overall objectives from this program are to provide cost, yield, chemical and physical properties of variable quality aviation turbine fuels produced from tar sands and heavy oils. GRA

N85-25540# Texas Univ., Arlington.
DETONATIONS OF SOLID EXPLOSIVES Final Report, 1 Nov. 1982 - 31 Oct. 1984
N. E. Brener 28 Dec. 1984 44 p
(Grant AF-AFOSR-0024-83)
(AD-A152012; AFOSR-85-0261TR) Avail: NTIS HC A03/MF A01 CSCL 19/1

The activation energy of explosive molecules is calculated. Progress has come in the form of four different approaches to the problem: configuration interaction method; Gaussian 82 Computer program; MNDOOC procedure; and Green's function techniques. The first Cray version of Dr. Henry F. Schhaefer's CI programs is available and access to several large Cray computers on which to run the programs. As a result, very large and highly accurate CI calculations will be performed on explosive molecules of interest. Access to a Cray version of Guassian 82 which is not yet available to the general scientific community was obtained and activation energy calculations are better and more accurate than those that were previously possible using Guassian 82. The MNDOC method, which is a new correlated version of the MNDO method, was used to compute accurate values for the activation energy of methyl nitrate. Green's function theory was used to derive a new one-electron equation that goes beyond previous one-electron equations to include higher order correlation terms. B.G.

N85-25541# Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
STUDIES OF THE COMBUSTION OF MODEL FUELS WITH LOW HYDROGEN CONTENT (PYROLYSIS OF POLYCYCLIC AROMATICS-DETECTION OF SOOT PRECURSORS) Final Report
S. H. Bauer 15 Jan. 1985 6 p
(Contract DE-AC02-80ER-10661)
(DE85-005422; DOE/ER-10661/4) Avail: NTIS HC A02/MF A01

Specific mechanisms which cause soot production in flames in internal combustion engines and shock tubes are discussed. The types of molecular species, both small radicals and ring structures, which are precursors to soot production were ascertained. The appearance of condensed ring aromatics is examined, and the rates of their production are determined. Products of pyrolysis were analyzed. DOE

N85-25198# Joint Publications Research Service, Arlington, Va.
CHRONIC FUEL SHORTAGES IN VOLGA CIVIL AVIATION ADMINISTRATION
A. Sherstnev *in its* USSR Rept.: Transportation (JPRS-UTR-84-017) 13 Jun. 1984 p 12-15 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 31 Mar. 1984 p 2 (For primary document see N85-25196 15-01)
Avail: NTIS HC A04/MF A01

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N85-25542 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
THE DESIGN AND VALIDATION OF SOFTWARE FOR DIMENSIONAL METROLOGY
G. T. Anthony and M. G. Cox Oct. 1984 24 p refs Sponsored by UK Department of Trade and Industry Metrology and Standards Requirements Board
(NPL-DITC-50/84; ISSN-0262-5369) Copyright. Avail: Issuing Activity

Computer-aided measuring systems for assessing mechanical components are discussed. Mathematical modeling of the measurement problem, in cases where the data can be regarded as accurate or possessing significant errors is reviewed. Direct and iterative methods, and numerical stability issues are considered. Advantages of modularization in the design of metrological algorithms and software are enumerated. For validation, aspects of black box testing relevant to metrological software are identified. Mathematical testing is introduced. Author (ESA)

N85-25543# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
EXPERIMENTAL INVESTIGATION OF ANNULAR AIR CURTAIN DOMES
B. Kamen and A. A. Haasz Jan. 1985 52 p refs Sponsored in part by Air Roofs Canada and NSERC
(UTIAS-288; ISSN-0082-5255) Avail: NTIS HC A04/MF A01

The performance of annular air-curtains as protective barriers against precipitation was investigated experimentally using a 60 cm diameter laboratory model and a 6 m diameter outdoor test facility. Precipitation was simulated by small size glass beads and water droplets. The scaling requirements for the particle-air jet interaction dynamics were reviewed and modified to explicitly include the effects of the simulation material. The effects of Reynolds number, however, are only implicitly included. Based on the results of this study a set of criteria for future tests that could lead to reliable projections for larger scale installations is presented in the form of dimensionless parameters. Author

N85-25544# Armament Systems, Inc., Aberdeen, Md.
US ARMY HUMAN ENGINEERING LABORATORY COMMUNICA-

TIONS SURVEY: A PILOT STUDY (HELCOMS-PS) Final Report
R. M. Phelps and G. A. Kupets, Sr. Nov. 1984 45 p
(Contract DAAK11-82-C-0003)
(AD-A151434; HEL-TN-14-84) Avail: NTIS HC A03/MF A01 CSCL 17/2

Voice radio traffic was collected at National Training Center exercises in Ft. Irwin, CA. The traffic consisted of five one-hour samples covering peak-period traffic on several command nets. This traffic underwent a detailed exploratory analysis and identified several human performance issues which will be subjected to further evaluation in a follow-on effort. Sample issues covered in this report include expected wait time, transmission rates, station utilization factor, message categorization, interference, and dialog patterns. GRA

N85-25545# Textron Bell Aerospace Co., Buffalo, N. Y.
FINGER MATERIALS FOR AIR CUSHION VEHICLES. VOLUME 1: FLEXIBLE COATINGS FOR FINGER MATERIALS Final Report, Jan. 1978 - Apr. 1981
P. K. Conn, I. C. Snell, and W. Klemens Dec. 1984 131 p
(Contract N00600-78-C-0250; F61-541)
(AD-A151438; Rept-7467-927048-Vol-1; DTNSRDC-85/003-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 11/3

Twenty polymer formulations from ten selected gum rubber polymers or polymer blends and fourteen formulations of castable liquid polyurethane polymers were characterized as coatings for the coated fabric that is the type material used to make flexible fingers for air cushion vehicles. The formulations were screened for crack growth and flexural fatigue resistance; the results were compared to results from a natural rubber/cisabutadiene blend control coating. In addition, selected polymers were evaluated with primary and secondary characterization tests and the results compared to results from the control formulation. One polymer also was used to evaluate the use of a reticulated carbon black to improve thermal conductivity. Several polymers had better crack growth resistance and a number had better flexural fatique resistance than the control polymer. A clorinated polyethylene polymer coated on nylon fabric had properties equivalent to the control polymer coated on nylon fabric. Hysteresis tests at different rates of deformation yielded results which suggested that the standard tests may not identify polymers with improved performance on air cushion vehicles. Woven fabric, knit, and mat structures were evaluated as reinforcements for polymer coatings; the knit and mat structures were not as efficient on a strength-to-weight basis as woven fabrics. GRA

N85-25546# Army Construction Engineering Research Lab., Champaign, Ill.
NEW CONTROL DESIGN PRINCIPLES BASED ON MEASURED PERFORMANCE AND ENERGY ANALYSIS OF HVAC (HEATING, VENTILATING, AND AIR-CONDITIONING) SYSTEMS Interim Report
D. C. Hittle and D. L. Johnson Jan. 1985 46 p
(AD-A151708; CERL-IR-E-85/02) Avail: NTIS HC A03/MF A01 CSCL 13/1

This report is one of a series on the development of heating, ventilating, and air-conditioning (HVAC) control systems that are simple, efficient, reliable, maintainable, and well-documented. This report identifies major problems associated with three currently used HVAC control systems. It also describes the development of a retrofit control system applicable to military buildings that will allow easy identification of component failures, facilitate repair, and minimize system failures. Evaluation of currently used controls showed that pneumatic temperature control equipment requires a very clean source of supply air and is also not very accurate. Pneumatic, rather than electronic, actuators should be used because they are cheaper and require less maintenance. Thermistor temperature detectors should not be used for HVAC applications because they require frequent calibration. It was found that enthalpy economy cycles cannot be used for control because the humidity sensors required for their use are prone to rapid drift, inaccurate, and hard to calibrate in the field. Performance of control systems greatly affects HVAC operating costs. Significant savings can be achieved if proportional-plus-integral control schemes are used. Use of the retrofit prototype control panel developed in this study on variable-air-volume systems should provide significant energy cost savings, improve comfort and reliability, and reduce maintenance costs. GRA

N85-25547# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN ANALYSIS OF GRID-BASED LINE DRAWING QUANTIZATION METHODS M.S. Thesis
L. A. Vallado Dec. 1984 114 p
(AD-A151847; AFIT/GCS/ENG/84D-31) Avail: NTIS HC A06/MF A01 CSCL 12/1

This document implements the parallel quantization scheme for quantizing line drawings. It also discusses the theory behind an algorithm for a rotated drawing quantization algorithm. The algorithm was also implemented during this thesis. Both of these algorithms were analyzed and compared. The parallel quantization scheme was compared with the previously implemented triangular quantization scheme. The rotated drawing algorithm was implemented using the parallel quantization scheme and compared using different rotations. The results of these computer programs were analyzed using two criterion: compactness and accuracy. Then recommendations were made using these results. GRA

N85-25548# California Univ., Livermore. Lawrence Livermore Lab.
INFLUENCE OF PHOSPHORUS CONTENT AND HEAT TREATMENT ON THE MACHINABILITY OF ELECTROLESS NICKEL DEPOSITS
C. K. Syn, J. W. Dini, J. S. Taylor, G. L. Mara, R. R. Vandervoort, and R. R. Donaldson 14 Jan. 1985 15 p refs Presented at the 4th Electroless Nickel Conf., Chicago, 14 Jan. 1985
(Contract W-7405-eng-48)
(DE85-007250; UCRL-91148; CONF-50495-1) Avail: NTIS HC A02/MF A01

Diamond turning is the use of a single point diamond tool on a precision lathe under very precisely controlled machine and environmental conditions to fabricate finished components. Coatings offer significant advantages for diamond turning applications inasmuch as they can be applied to light weight substrates such as aluminum or beryllium, or unusual substrates such as molybdenum or glass. One of the most used frequently employed coatings for diamond turning applications is electroless nickel. On occasions, electroless nickel deposits are not diamond turnable, e.g., tool life is shortened. This could be a function of phosphorus content, age of the solution, stress in the deposit, additives in the solution or heat treatment conditions. Efforts include machinability studies on electroless nickel deposits varying in composition from 1.8-13% phosphorus in the as-deposited condition, and after heating at 200, 400 and 600 (0) C. DOE

N85-25549# Brookhaven National Lab., Upton, N. Y. Dept. of Applied Science.
ELECTRICALLY CONDUCTIVE POLYMER CONCRETE OVERLAYS
Jack J. Fontana and Ronald P. Webster Aug. 1984 30 p refs Presented at the 64th Ann. Transport. Res. Board Meeting, Washington, D.C., 14-18 Jan. 1985
(Contract DE-AC02-76CH-00016)
(DE85-006728; BNL-35669; CONF-850115-5) Avail: NTIS HC A03/MF A01

The use of cathodic protection to prevent the corrosion of reinforcing steel in concrete structures has been well established. Application of a durable, skid-resistant electrically conductive polymer concrete overlay would advance the use of cathodic protection for the highway industry. Laboratory studies indicate that electrically conductive polymer concrete overlays using conductive fillers, such as calcined coke breeze, in conjunction with polyester or vinyl ester resins have resistivities of 1 to 10 ohm-cm. Both multiple-layer and premixed mortar-type overlays were made. Shear bond strengths of the conductive overlays to

concrete substrates vary from 600 to 1300 psi, with the premixed overlays having bond strengths 50 to 100% higher than the multiple-layer overlays. DOE

N85-25550# Little (Arthur D.), Inc., Cambridge, Mass.
HYDROCARBON POOL AND VAPOR FIRE DATA ANALYSIS Final Report
K. S. Mudan Oct. 1984 111 p
(Contract DE-AC01-83EP-16008)
(DE85-005857; DOE/EP-16008/1) Avail: NTIS HC A06/MF A01

The flame geometry and thermal radiation data from a series of large scale experiments involving liquefied petroleum gas (LPG) and gasoline spills on water were analyzed. The spill quantity varied from 4 cu m to approximately 6 cu m. The LPG pool fire flame height to diameter ratio were between 3.5 and 4.5. The gasoline flame height was about 2. The flame emissive powers for LPG pool fires ranged from 78 kW/sq m to 115 kW/sq m. The average surface emissive power for gasoline pool fire was 40 kW/sq m. The LPG vapor fire emissive power ranged from 159 to 259 kW/sq m. DOE

N85-25551# Food and Drug Administration, Rockville, Md. Center for Devices and Radiological Health.
OPTICAL RADIATION EMISSIONS FROM SELECTED SOURCES. PART 2: HIGH INTENSITY DISCHARGE LAMPS
W. B. Knight Nov. 1984 280 p
(PB85-149136; HHS/PUB/FDA-85-8236-Pt-2;
FDA/CDRH-85/11-Pt-2) Avail: NTIS CSCL 13A

Values are presented for irradiance, effective irradiance according to the ACGIH Threshold Limit Values, radiance, and illumination for members of the high intensity discharge source family (e.g., mercury vapor). Plots of spectral irradiance are also given. GRA

N85-25552# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
18 Apr. 1984 61 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-012) Avail: NTIS HC A04/MF A01

This West Europe report presents news articles and reports on many areas of science and technology. Research topics covered include: (1) advanced materials; (2) aerospace, and (3) factory automation. For individual titles, see N85-25553 through N85-25556.

N85-25553# Joint Publications Research Service, Arlington, Va.
MBB USES NEW CFC FORM TOOL FOR TITANIUM ALLOY AIR INTAKE **c37**
In its West Europe rept.: Sci. and Technol. (JPRS-WST-84-012) 18 Apr. 1984 p 1-2 Transl. into ENGLISH from VDI Nachrichte (Dusseldorf), 2 Mar. 1984 p 20 (For primary document see N85-25552 15-31)
Avail: NTIS HC A04/MF A01

A method of manufacturing large structural components which is both weight saving and economical in comparison with presently employed processes is described. By superplastic forming in a forming tool made of carbon fiber reinforced carbon (CFC) the development engineers have produced an air intake section out of titanium alloy. The outlet pipe constructed out of the TiAl6V4 alloy has a plasma welded longitudinal seam, has a diameter of 460 mm, a wall thickness of 3.5 mm and a length of 1,500 mm. It is closed at both ends and blown at a temperature of 925 C with argon in a forming tool made of CFC. At this temperature the titanium alloy enters the superplastic state and may be formed with a forming velocity of about 1 percent per minute, with elongations of several hundred percent being easily attained. After the superplastic forming the nominal length of the finished test component amounts to 1,000 mm and comes to over 1,400 mm. An entirely new feature of the immediately successful is the first time use of carbon fiber reinforced carbon (CFC) as a forming material. B.W.

N85-25554# Joint Publications Research Service, Arlington, Va.
CALENDAR OF ARIANE LAUNCHES 1984 - 1987 **c15**
In its West Europe rept.: Sci. and Technol. (JPRS-WST-84-012) 18 Apr. 1984 p 3-5 Transl. into ENGLISH from AFP Sciences (Paris), 23 Feb. 1984 p 14-15 (For primary document see N85-25552 15-31)
Avail: NTIS HC A04/MF A01

A schedule of Ariane launches for 1984 to 1987 is presented. A description of satellite type and mission objective is given. B.W.

N85-25555# Joint Publications Research Service, Arlington, Va.
FRENCH ROBOTICS RESEARCH AT GRENOBLE LABS **c37**
Jean-Claude Hanus *In its* West Europe rept.: Sci. and Technol. (JPRS-WST-84-012) 18 Apr. 1984 p 32-36 Transl. into ENGLISH from Micro et Robots (Paris), Mar. 1984 p 8-12 (For primary document see N85-25552 15-31)
Avail: NTIS HC A04/MF A01

The activities of the INPG (Grenoble National Polytechnic Institute) are highlighted. Current search in the fields of automation, robotics and artificial intelligence is examined in detail which are at the heart of our present concerns. B.W.

N85-25556# Joint Publications Research Service, Arlington, Va.
FRENCH FIRM DEVELOPS NEW KIND OF CTD CAMERA FOR ROBOTS **c37**
In its West Europe rept.: Sci. and Technol. (JPRS-WST-84-012) 18 Apr. 1984 p 40-41 Transl. into ENGLISH from AFP Sciences (Paris), 23 Feb. 1984 p 73 (For primary document see N85-25552 15-31)
Avail: NTIS HC A04/MF A01

An intelligent camera was developed that makes possible the analysis of images at their true speed. Industrial robotics is currently the most widespread application for this camera. The cathode tube of traditional cameras has been replaced by a CTD collector (charge transfer device). The CTD collector, together with an integrated calculator extracts from the image only what the user needs, allows the synchronization of the picture with the object observed. It also makes it possible to obtain a picture under uncertain lighting conditions and assembly line speeds. B.W.

N85-25557# Georgia Dept. of Transportation, Forest Park. Office of Materials and Research.
OVERLAYS FOR PLAIN JOINTED CONCRETE PAVEMENTS Final Report, 1975 - 1984
W. Gulden and D. Brown Sep. 1984 72 p refs Sponsored by FHA
(PB85-156297) Avail: NTIS HC A04/MF A01 CSCL 13B

This report describes the construction and performance of 4 concrete and 16 asphalt overlay test sections after nine years of traffic. The test sections were placed on I-85 which carries a substantial number of heavy trucks to determine what treatments and overlay type and thickness would give acceptable performance. The concrete overlay sections were placed in 1975 and consisted of 3 inch, 4 1/2 inch, and 6 inch CRC and 6 inch jointed PCC with 15 ft. and 30 ft. joint spacing. The asphalt sections were placed in 1976 with the variables being overlay thickness of 2 inches, 4 inches, and 6 inches and the placement of two geotextiles and strips of a waterproofing membrane for each overlay thickness. An Arkansas base test section was also included in the experiment. GRA

N85-25558# New York State Dept. of Transportation, Albany. Engineering Research and Development Bureau.
PAVEMENT-MARKING MATERIALS: NEW YORK'S EXPERIENCE Interim Report
James E. Bryden and Gary F. Gurney Apr. 1984 25 p refs Sponsored by Federal Highway Administration
(PB85-153294; RR-112; FHWA/NY-RR-84-112; IR-1) Avail: NTIS HC A02/MF A01 CSCL 13B

A wide range of stripping materials is available for pavement-marking programs. The four basic systems; traffic paint, thermoplastic, preformed tape, and field-reacted materials are described, as well as the various materials used in each system, including cost,

durability, methods of installation and mantenance, visibility, and handling safety. New York State's pavement marking policies are described. Information on stripping costs, material usage, and results of durability studies is provided, based on New York's experience with most currently available marking materials. GRA

N85-25559# Rockwell International Science Center, Thousand Oaks, Calif.
COMPUTER CONTROLLED ACQUISTION OF CORROSION RATE DATA FROM MULTIPLE SENSORS
M. Kendig, S. Jeanjaquet, and F. Mansfeld Jan. 1985 19 p refs (Contract EPA-68-02-3741)
(PB85-157378; EPA-600/D-85-018) Avail: NTIS HC A02/MF A01 CSCL 13B

Determination of the polarization resistance from multiple sensors under computer control provides rapid, reproducible and accurate means for determining corrosion rates ranging over many orders of magnitude for large test matrices. Computerized techniques can simultaneously evaluate the response of many sensors to variations in the composition of a corrosive environment. Examples are presented of computerized corrosion monitoring of atmospheric corrosion rate monitors subjected to pollutant transients, and of materials in simulated flue gas desulfurization media containing trace elements. Author (GRA)

N85-25560# Joint Publications Research Service, Arlington, Va.
EAST EUROPEAN REPORT: SCIENCE AND TECHNOLOGY
11 Mar. 1985 144 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-85-010) Avail: NTIS HC A07/MF A01

Computer technology in Czechoslovakia and applications of microelectronics in Romania and Yugoslavia are highlighted. Computer aided design and manufacturing in East Germany is discussed. The use of high technology for military purposes and protection against bacteriological warfare agents in Bulgaria are explored. For individual titles, see N85-25561 through N85-25564.

N85-25561# Joint Publications Research Service, Arlington, Va.
PRODUCTION CELLS WITH IR 2SO ROBOT EXAMINED c37
In its East European Rept.: Sci. and Technol. (JPRS-ESA-85-010) 11 Mar. 1985 p 79-85 Transl. into ENGLISH from Fertigungstechnik und Betrieb (Berlin, East Germany), v. 34, no. 9, Sep. 1984 p 567-569 (For primary document see N85-25560 15-31)
Avail: NTIS HC A07/MF A01

A high-performance lathe DFS 2/CNC, an industrial robot (IR 2SO), and a station for stacking pallets permits high-efficiency industrial manufacturing of rotationally symmetric parts in small and medium mass production. This manufacturing cell is well adapted to turning chucked parts of the most varied workpiece contours with tight dimensional and shape tolerances and high levels of surface quality. By means of automatic workpiace input and manipulation, it is possible to have minimal labor manufacturing in one shift. High reliability of the mechanical and electrical component groups gaurantees a high level of availability of the manufacturing cell. A.R.H.

N85-25562# Joint Publications Research Service, Arlington, Va.
ELECTRICAL FEATURES OF NEW DNC, CNC SYSTEM VIEWED
W. Fritzsch, D. Kochan, J. Schaller, and H. J. Zander *In its* East European Rept.: Sci. and Technol. (JPRS-ESA-85-010) 11 Mar. 1985 p 86-103 refs Transl. into ENGLISH from Mes. Steuern Regeln (Berlin, East Germany), v. 27, no. 10, Oct. 1984 p 434-439 (For primary document see N85-25560 15-31)
Avail: NTIS HC A07/MF A01

Control structures capable of solving the problems of a flexible minial-labor manufacturing process are analyzed. The present state of development of equipment technology is described, and possible ways of modeling control processes are surveyed. Concepts which are frequently differently interpreted in various specialized disciplines are systematized, with a view toward creating the prerequisites for interdisciplinary cooperation. Problems and information flow during the preparatory and performance phases of manufacturing are examined with respect to coupling CAD/CAM functions. Mathematical modeling for direct numerical control is explored. A.R.H.

N85-25563# Joint Publications Research Service, Arlington, Va.
FLEXIBLE MACHINING SYSTEMS DESCRIBED
H. J. Butters *In its* East European Rept.: Sci. and Technol. (JPRS-ESA-85-010) 11 Mar. 1985 p 104-109 refs Transl. into ENGLISH from Fertigungstechnik und Betrieb (Berlin, East Germany), v. 34, no. 10, Oct. 1984 p 592-594 (For primary document see N85-25560 15-31)
Avail: NTIS HC A07/MF A01

The rationalization and gradual automation of short rotationally symmetric parts in the Saalfeld VEB Machine Tool Factory was carried out in three stages: (1) part-specific manufacturing; (2) automated production line for manufacturing toothed gears; and (3) automated manufacturing section for short rotationally symmetric parts. The development of numerically controlled machine tools and of industrial robot technology made possible automated manufacturing. The design of current facilities is explored, manufacturing control is examined, experience is reported. A.R.H.

N85-25564# Joint Publications Research Service, Arlington, Va.
OPERATION OF PRISMA FLEXIBLE MANUFACTURING SYSTEM
W. Schroeder, K. Rudolph, and E. Mueller *In its* East European Rept.: Sci. and Technol. (JPRS-ESA-85-010) 11 Mar. 1985 p 110-118 ref Transl. into ENGLISH from Fertigungstechnik und Betrieb (Berlin, East Germany), v. 34, no. 10, Oct. 1984 p 595-597 (For primary document see N85-25560 15-31)
Avail: NTIS HC A07/MF A01

The development of technology and organization in the parts manufacturing taking place in machine construction factories occurs both in job site automation and in process-referred automation. It is characterized by the comprehensive employment of microelectronics which in turn leads to new more highly automated engineering solutions in the areas of manufacturing devices, transport technology and storage technology and manufacturing control. Systems used to process about 850 prismatic individual parts differing in design, differing technologically, and having the maximum dimensions 500 mm x 800 mm x 500 mm are described. A.R.H.

N85-25565# Joint Publications Research Service, Arlington, Va.
USSR REPORT: ELECTRONICS AND ELECTRICAL ENGINEERING
27 Mar. 1985 86 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UEE-85-005) Avail: NTIS HC A05/MF A01

Topics covered include: acoustics, speech, and signal processing; antennas and propagation; broadcasting and consumer electronics; circuits and systems; communications; components, hybrids, and manufacturing technology, computers; electron devices, instrumentation and measurements; microwave theory and techniques, power engineering; and electro-optics. For individual titles, see N85-25566 through N85-25595.

N85-25566# Joint Publications Research Service, Arlington, Va.
FIELD OF POINT SOURCE OF LOW-FREQUENCY SOUND IN ATMOSPHERE WITH ALTITUDINALLY NONUNIFORM WIND Abstract Only c71
I. P. Chunchuzov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 1 refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 4, Jul. - Aug. 1984 p 546-552 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

The problem of propagation of infrasonic waves from a point source through a stratified moving atmosphere is solved almost exactly, analytically, or the case of an altitudinally nonuniform purely horizontal wind. The harmonic point source is assumed to be close to or on the ground and the wind velocity is assumed to vary vertically with an exponential profile Vx(2)c = V(0)c (1-3 to

the -2/h power) (V-horizontal wind velocity; c- acoustic velocity, h- characteristic scale of altitudinal wind nonuniformity). The corresponding equation for the quasi-potential velocity is solved for the altitudinal amplitude profiles of the zero-order normal wave in a narrow atmospheric waveguide (k(0)h = 1) and in a wide atmospheric waveguide (k(0)h = 2 pi), as well as of the third-order normal wave (k(0)h = 22) and the sixth-order normal wave (k(0)h = 40). From the solution is also determined the dependence of the wave field amplitude and phase on the distance from the source. Results are based on k(0)h > > V x/c (k(0) - wave number) and V(x) < < c, with h = 30 m (approximately the wavelength of sound). Author

N85-25567# Joint Publications Research Service, Arlington, Va.
WAVE DESCRIPTION OF SOUND PROPAGATION THROUGH STRATIFIED MOVING ATMOSPHERE Abstract Only **c71**
V. Ye. Ostashev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 2 refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 4, Jul. - Aug. 1984 p 521-526 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

The one-dimensional Helmholtz equation is applied to the cases of a finite sound source outside moving air and of a monochromatic point source moving inside moving air at some other velocity. With the equation of continuity linearized for each case, solution of the Helmholtz equation yields the spectral density of sound pressure. The sound pressure field is obtained from the latter upon evaluation of the Fourier integral. For the sound pressure, the spatially uniform high-frequency asymptote of the solution yields an expression which contains two constants and the Airy function of a negative argument. The results thus differ from those for a still atmosphere by including an extra amplitude factor and a vertical wave number dependent on the wind profile. The altitude of the reversal point also depends on the wind profile. The validity of geometrical acoustics in the case of a moving medium is established for the waveguide part of sound pressure and found to depend on the ratio of wind velocity to sound velocity as well as on the inclination angle of the wave vector to the horizontal.
Author

N85-25568# Joint Publications Research Service, Arlington, Va.
SURFACE ACOUSTIC WAVE STRUCTURE AND VOLUME WAVES Abstract Only **c71**
V. I. Anisimkin, I. N. Kotelyanskiy, and M. A. Magomedov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 2-3 refs Transl. into ENGLISH from Akust. Zh., v. 30, no. 4, Jul. - Aug. 1984 p 417-423 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

A surface acoustic wave in an anisotropic single crystal and three volume waves (longitudinal, fast transverse, slow transverse) propagating through it in the same crystallographic direction are examined, to determine the optimum crystal cut for acoustoelectronic devices. The structural characteristics of a surface acoustic wave are ellipticity of surface displacement, depth of localization, and amplitude of its vertical component. The propagation characteristics of volume waves are their polarizations and velocities. An analysis of all these waves and their characteristics in crystals with various lattice symmetries (cubic, hexagonal, trigonal, tetragonal) reveals that, regardless of the symmetry, each different displacement ellipse in a surface acoustic wave corresponds to a definite disposition of the triad of mutually orthogonal partial displacement components in that surface acoustic wave. author

N85-25569# Joint Publications Research Service, Arlington, Va.
EFFECT OF AXISYMMETRIC VIBRATION MODES ON SENSITIVITY AND DI RECTIVITY CHARACTERISTICS OF PIEZOCERAMIC SPHERE Abstract Only **c76**
M. Ye. Dyubchenko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 3-4 refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 4, Jul. - Aug. 1984 p 477-481 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

The performance of a piezoceramic hydrophone sphere with a hole for the electric cable is analyzed, taking into account the axisymmetric vibration modes and the resulting stresses produced by the cutout but assuming that a seal cover restores the spherical symmetry and does not alter the natural modes. The analysis is based on the corresponding equation of electromechanical state for such a sphere in the field of a plane sound wave. Conditions are established, in terms of constraints on the capacitor plates, for excitation of odd-order and even-order (including zero-order) axisymmetric modes. The sensitivity and the radiation pattern of such a hydrophone are calculated for a thin spherical shell with or without a passive zone. Minimization of the effect of axisymmetric modes results in a maximally isotropic nondirectional hydrophone, a passive zone with a smaller than 20 deg meridional angle being both adequate and feasible. A.R.H.

N85-25570# Joint Publications Research Service, Arlington, Va.
SOUND EMISSION BY PARTICLE BEAM PASSING THROUGH HOLE IN RIGID SHIELD Abstract Only **c71**
V. I. Pavlov and A. I. Sukhorukov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 4 refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 4, Jul. - Aug. 1984 p 527-531 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

Sound emission by a particle beam passing through a hole in an acoustically rigid plane shield is analyzed, assuming a thermal mechanism of partial energy transfer from particles in the beam to particles of the ambient medium and assuming a uniform rate of heat release along the path of a beam particle. The fundamental system of corresponding equations of acoustics is reduced to the wave equation for the velocity potential, and a Fourier transformation of the latter with respect to time yields a nonhomogeneous Helmholtz equation for the spectral characteristics of sound emission. Its solution is the sum of two parts, the particular solution describing the field of sound sources and the general solution satisfying the homogeneous Helmholtz equation. Differentiation of the integral equivalent of that general solution in the plane of the shield and establishment of the boundary conditions on the basis of the particular solution yield the angular distribution of the spectral density of radiation energy and the dependence of that distribution on two parameters. Author

N85-25571# Joint Publications Research Service, Arlington, Va.
RECORDING OF ACOUSTIC WAVE IN GASEOUS MEDIUM WITH THIN-FILM PYROELECTRIC TRANSDUCERS Abstract Only **c71**
S. V. Belyayev, V. M. Gorelik, K. A. Konkov, Ye. A. Myzgin, G. M. Pleshkov, E. D. Polskikh, and B. A. Chayanov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 5 refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 4, Jul. - Aug. 1984 p 428-431 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

The feasibility of using thin pyroelectric films instead of thick ceramic ones for recording acoustic waves in air or other gaseous media is examined. The sensitivity of such a microphone is determined by the proportionally of its output voltage to the amplitude of temperature fluctuations and the proportionality of the latter to the acoustic pressure. Experiments were performed using a 0.7 micron thick pyroelectric film between 500 A thick upper and lower eletrodes, on a glass substrate with 0.1-0.2 micron thick polymer coating. A circular hole at the center of the substrate allowed direct thermal and acoustic contact between the transducer and the ambient air on both sides. Theoretical analysis and evaluation of data are based on calculation of heat transfer from air to transducer film. The differential equation of heat conduction was solved assuming a uniform distribution of heat sources in the acoustic near field and a sinusoidal temperature fluctuation in time. Results indicate no better sensitivity of thin films than thick ceramic ones, but that a thin-film transducer with 30 mu V/Pa sensitivity can record acoustic waves at 1 kHz frequency. Author

N85-25572# Joint Publications Research Service, Arlington, Va.
SPACE PROCESSING OF ACOUSTIC SIGNALS IN PLANE-PARALLEL WAVEGUIDE Abstract Only **c71**
A. Ya. Kalyuzhnyy, L. G. Krasnyy, and V. V. Krizhanovskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 6 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 4, Jul. - Aug. 1984, 11 Jan. 1983 p 495-501 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

A two-dimensional antenna array in a vertical plane inside a horizontal waveguide is considered for processing of acoustic signals from a source also inside that waveguide. Algorithms of processing are constructed on the basis of Hankel function asymptotics in the Fraunhofer region, assuming a delta-corre lated interference. The optimum algorithm is found to have generally higher interference immunity than the algorithm for free space, both having the same interference immunity only in the special case of a linear horizontal antenna array. The amplitude-phase distribution in the antenna aperture and the transverse velocity profile are calculated, whereupon the dependence of the signal-to-interference ratio on the distance from source to antennas as well as the sensitivity of the processing algorithm to the error of distance reading are determined. Author

N85-25573# Joint Publications Research Service, Arlington, Va.
SYSTEM OF PHASE-LOCK AUTOMATIC FREQUENCY CONTROL WITH ACOUSTOELECTRONIC CONVOLVER Abstract Only **c33**
V. M. Tarasov and S. I. Brygin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 6-7 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Radioelekton. (Kiev), v. 27, no. 10, Oct. 1984 p 89-90 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

The feasibility of using an acoustoelectronic convolver with surface acoustic waves for phase-lock automatic freqency control is examined on the basis of the fundamental equation for the convolver output signal. When the phase error is constant along the interaction space, this equation simplifies to Y(t) = L [(C(1) + C(2) sino)]. The nonlinear dynamics as well as theoretical conditions for stability over the 0 to 2 pi range of phase shift and for absolute instability having been established, pull-in and pull-out limits are determined for first-order phase-lock control loop with an interdigital convolver. Author

N85-25574# Joint Publications Research Service, Arlington, Va.
PSYCHOLOGICAL AND PHYSIOLOGICAL BASIS OF STEREOPHONIC EFFECT Abstract Only **c71**
A. P. Yefimov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 7 Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 10, Oct. 1984 p 12-16 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

The stereophonic effect is related to binaural perception and resolution of sound level differences and time delays, front and back as well as left and right hearing, threshold sensitivities, and depth of hearing. Development of stereophonic systems stimulated extensive interest and research in both psychological and physiological aspects of this effect, involving not only the ears but also the head. Various models of hearing were proposed, the most comprehensive one combining resonance characteristics and corresponding frequency analysis with correlation analysis. The latter implies an a priori given signal and interference functions or spectra. Another fundamental aspect of the stereophonic effect is the physical one. The physical mechanisms of detection, filtration, and localization of sound depend on its spectrum and degree of coherence as well as the noise content. The theory of the stereophonic effect covers both the listener and the performer.
Author

N85-25575# Joint Publications Research Service, Arlington, Va.
INTERFERENCE IMMUNITY OF OPTICAL RADAR SYSTEM WITH PHASED ANTENNA ARRAY Abstract Only **c32**
Ya. V. Alishev and V. Ye. Yamaykin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 8 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelectron. (Kiev), v. 27, no. 10, Oct. 1984 p 22-27 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

A phased antenna array of an optical radar system with single-mode or phase-locked sources is analyzed for interference immunity. A major factor influencing the performance as well as the method of analysis is the relative magnitudes of coherence length and path difference, the latter characterizing the interference pattern of light beams and its effect on the antenna radiation pattern. Although a path difference much smaller than the coherence length permits assumption of a quasimonochromatic radiation, interference must be accounted for when the path difference is comparable with the coherence length. The directive gain and the probability of detection error are calculated, assuming Poisson distributions of signal photons with either vertical or horizontal polarization and of noise photons at the receiver input. Estimates indicate that reducing the error probability to below 0.00001 is feasible by phasing the antenna of an optical radar system operating under normal conditions. Author

N85-25576# Joint Publications Research Service, Arlington, Va.
COPHASAL HORIZONTAL WIDEBAND ARRAY ANTENNAS FOR TRANSMITTING WITH ASYMMETRIC OUTPUT Abstract Only **c32**
S. P. Belousov, G. A. Kliger, and N. A. Eskin *In its* USSR Rept.: Electron and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 9 refs Transl. into ENGLISH from Electrosvyaz (Moscow), no. 9, Sep. 1984 p 52-55 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

Type SGDRA cophasal horizontal wideband antennas for transmitters with asymmetric (single-stage) output are described. An antenna of this kind consists of rigid shunt vibrators and an asymmetric feeder channel. The latter is formed by symmetric overhead feeders, a symmetrizing device being available for operation with a single-stage transmitter. Two typical construction are: one tower section with four tiers of vibrator groups and two tower sections with eight tiers of vibrator groups on each, with an adapter from symmetric to asymmetric feeder channel in each case. Various arrangements for power feed are possible, coaxial cables being most suitable for this purpose. The performance characteristics of these antennas are discussed. Author

N85-25577# Joint Publications Research Service, Arlington, Va.
ANTENNA WITH OUTBOARD EXCITER FOR 3.4-13.25 GHz FREQUENCY RANGE Abstract Only **c32**
A. A. Timofeyeva, I. A. Kozlovskaya, and Z. K. Khlopkova *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 9-10 Transl. into ENGLISH from Elektrosyvaz (Moscow), no. 8, Aug. 1984 p 22-28 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

A nonaxisymmetric antenna with a circular aperture 1.1 m in diameter four has rotatable exciters, sharply bent horns tilting 22 deg from the vertical which match frequency bands 4, 6, 8, 11 GHz wide respectively. The performance with ech of the exciters were evaluated including the frequency characteristics of gain, surface utilization factor, and standing-wave ratio under horizontal polarization and vertical polarization. The radiation patterns meet guarantees within and around the main lobe as well as within the side lobes in the far field. The antenna with any exciter has a stable and smooth nonoscillating frequency dependence of gain and surface utilization factor. With the 4 GHz exciter (diameter 70 mm) or with the 6 GHz exciter (diameter 43 mm) there is a small gain but a high interference immunity. With the 8 GHz exciter (diameter 32 mm) or with the 11 GHz exciter (diameter 24 mm) the radiation pattern has very weak side lobes in front and in back. Small size weight make this antenna suitable as etalon for measuring the gain characteristics of large antennas. Author

N85-25578# Joint Publications Research Service, Arlington, Va.
CONVERTERS OF SUM/DIFFERNCE OF CODES TO FREQUENCY Abstract Only **c32**
G. L. Sedletskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 11 refs Transl. into ENGLISH from Elecktrosvyaz (Moscow), no. 8, Aug. 1984 p 54-56 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

Converters of the sum/difference of codes to frequency are considered and the principle of building such converters is explained. The basic device is a code-to-frequency converter, an extension of a discrete phase inverter into a digital synthesizer with summation of pulse sequences. A 6-bit converter built with series K155IYe8 integrated microcircuits is already available and several of them can be combined for a larger number of bits. the sum of any number of binary codes A(1),...,A(P+0) can then be converted to frequency by direct simmation of the frequencies of corresponding pulse sequences. Because frequency is a nonnegative quantity, the sum of codes corresponding to a frequency sum. In the case of three codes, accordingly, A(3) < A(1) + A(2) where A(3) is a code corresponding to the subtrahend frequency. Several logic schemes are possible for realization of such converters. The frequency spectra of their output signals contain various features, however, which need to be further examined. Author

N85-25579# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF SPECTRAL CHARACTERISTICS OF MULTILEVEL DIGITAL COMPUTING SYNTHESIS Abstract Only **c60**
S. Ya. Shishov and N. P. Yampurin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 12 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Kiev), v. 27, no. 10, Oct. 1984 p 66-68 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

A digital computing synthesizer of multilevel signals is considered which consists of a digital phase storage, a code-to-function converter, a digital-to-analog converter, and a low-pass filter in series. The spectral characteristics of such a synthesizer are analyzed upon introduction of the parameter NB = 2R/N(o) (N(o)-number of phase quantization levels), which characterizes the converter output resulting from multiplication of the storage content by 1,2,3... The ratio of useful signal to largest spurious component within the O-f(s)-range is calculated as a function of the code length for various numbers of amplitude quantization levels N(A). The results indicate that for a sinusoidal signal this ratio is principally determined by the number of amplitude quantization levels, namely P = 4 + 61og(2)N(A) + or - 2 dB. The results are applicable to such synthesizers built with series K533 logic microcircuits. Author

N85-25580# Joint Publications Research Service, Arlington, Va.
ADAPTIVE DETECTION OF NOISE SIGNAL ACCORDING TO NEUMANN-PEARSON CRITERION Abstract Only **c32**
Yu. A. Padiryakov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 13 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Kiev), v. 27, no. 10, Oct. 1984 p 71-73 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

Optimum detection according to the Neumann-Pearson criterion is considered in the case of a random Gaussian noise signal, stationary during measurement, and a stationary random Gaussian background interference. Detection is based on two samples, their statistics characterized by estimates of their spectral densities, it being a priori known that sample A from the signal channel is either the sum of signal and interference or interference alone and sample B from the reference interference channel is an interference with the same spectral density as that of the interference in sample A for both hypotheses. The probability of correct detection is maximized on the average, first in the 2N-dimensional space of signal spectral density and interference spectral density readings, by fixing the probability of false alarm at each point so as to stabilize it at a constant level against variation of the interference spectral density. Deterministic decision rules are established. The algorithm is then reduced to equivalent detection in the N-dimensional space of the ratio of sample A readings to sample B readings. Author

N85-25581# Joint Publications Research Service, Arlington, Va.
TRANSIENT PROCESSES IN TUNED AMPLIFIER DURING PHASE-SHIFT KEYING WITH SMOOTH PHASE VARIATION Abstract Only **c33**
N. A. Kamalyayev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 14 refs Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 11, Nov. 1984 p 50-53 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

Phase telegraphy with 0 to 180 deg keying combines high interference immunity with vulnerability to overvoltages, protection against the latter by means of decremental attenuation resulting in some loss efficiency. For an optimum design of such a system, which contains a tuned amplifier, the transient processes affecting the amplitude of the output signal envelope are analyzed for various smooth laws of phase variation on the input side. A comparison of varying the phase as linear, second degree parabolic, or third degree parabolic function of time, and calculation of the corresponding envelopes of instantaneous frequency deviation for a single stage amplifier indicate that in each case the variation of output signal amplitude increases with increasing instantaneous relative frequency deviation. The transient period is in each case shorter than in the case of jumpwiser or stepwise phase variation, which makes smooth phase variation preferable. Author

N85-25582# Joint Publications Research Service, Arlington, Va.
AUTOMATION OF SERVICIBILITY OF RADIO-RELAY STATION EQUIPMENT Abstract Only **c32**
A. G. Uryev, Ye. I. Mishkin, and G. Ye. Itkis *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 15 refs Transl. into ENGLISH from Electrosvyaz (Moscow), no. 8, Aug. 1984 p 11-14 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

Automation of the serviceability of radio relay station equipment must ensure central gathering and primary processing of reliable instrument reading with subsequent display on the control panel, detection and recording of failures soon enough, advance enough warning based on analysis of detertioration symptoms, and correct remote measurement of equipment performance parameters. Such an inspection will minimize transmission losses while reducing nonproductive time and labor spent on documentation and measurement. A multichannel automated inspection system for this purpose should operate by a parallel rather than sequential procedure. Digital data processing is more expedient in this case than analog method and, therefore, analog to digital converters are required. Spepcial normal, above limit and below limit test signals provide means of self-inspection, to which must be added adequate interference immunization, stabilization, and standby power supply. Use of a microcomputer permits overall refinement and expansion of the inspection system while it minimizes though not completely eliminates dependence on subjective judgment.
Author

N85-25583# Joint Publications Research Service, Arlington, Va.
SYSTEM OF LIGHT PROTECTION OF ANTENNA-MAST STRUCTURES OF RADIO-RELAY LINES Abstract Only **c09**
V. Ye. Larin, YE. V. Martynov, and M. P. Tischenko *In its* USSR Rept.: Electron and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 15-16 refs Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 8, Aug. 1984 p 14-15 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

A light guard for equipment of radio relay links in airports has been developed which draws not more than 100 W for a 24 V d.c. source. It provides automatic local or remote switching on and switching off, local or remote failure monitoring of 50% installed lighting capacity, and continuous capital investment accompanied by a decrease of operating costs. These trends are stimulated by

introduction of electronic and quasielectronic automatic switching as well as by changeover to integrated service digital networks with channel switching, message switching, or hybrid switching. All three forms of integrated service digital networks have been and continue to be evaluated comparatively with respect to technical feasibility and cost effectiveness as well as reliability and structural optimization. Author

N85-25584# Joint Publications Research Service, Arlington, Va.
FREQUENCY SELECTION FOR DISPERSION SIGNAL IN SATELLITE COMMUNICATION LINES Abstract Only **c32**
V. M. Dorofeyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-8-005) 27 Mar. 1985 p 31 refs Transl. into ENGLISH from Electrosvyaz (Moscow), no. 9, Sep. 1984 p 8-10 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

Interference produced by a satellite communication system in other communication systems operating at the same frequency band is suppressible by dispersion of the transmitted energy. This method is used in one channel per carrier systems, which have particularly low interference immunity. Examples are SPADE and SCPC systems, both using pulse-code modulation and phase keying. Selection of the frequency for a dispersion signal requires determination of the maximum allowable interference level in the presence of a fast dispersion signal, the frequency of the latter being either equal to or higher than the scan-line frequency. Here this determination is made analytically, by estimating the error probability in a one channel per carrier channel. The maximum allowable level of dispersion interference is then related to this error probability, assuming that presence of such an interference will increase the error probability from 10 to the minus 7th power to .000001 as a basis. Author

N85-25585# Joint Publications Research Service, Arlington, Va.
INTERKOSMOS PROGRAM OF SPACE COMMUNICATION DEVELOPMENT Abstract Only **c32**
L. Ya. Kantor *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-85-005) 27 Mar. 1985 p 45 refs Transl. into ENGLISH from Electrosvyaz (Moscow), no. 9, Sep. 1984 p 1-3 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

Countries participating in the Intercosmos space communication development program are Bulgaria, Cuba, Czechoslovakia, the GDR, Hungary, Mongolia, Poland, Romania and the Soviet Union. Joint task groups from these countries are currently working in seven separate areas of development: (1) utilization of new frequency ranges; (2) optimum methods of signal transmission via satellite on the basis of the latest available technology; (3) implementation of principles of interaction between satellite and earth communication systems; (4) development and optimization of complete equipment for ground stations of satellite communication systems; (5) suppression of mutual interference between satellite communication systems and ground services; (6) development of satellite television broadcasting systems in 12-GHz frequency band, construction of prototypes and experimental operation; (7) development of low-noise receiver devices, among them parametric and transistor amplifiers for 3.7-4.2 GHz, 11-12 GHz, and 20-30 GHz ground stations. Author

N85-25586# Joint Publications Research Service, Arlington, Va.
PRELIMINARY ESTIMATION OF MUTUAL INTERFERENCE BETWEEN FIXED SATELLITE SERVICE SYSTEMS Abstract Only **c32**
S. V. Borodich *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 45-46 refs Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 9, Sep. 1984 p 4-7 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

The method of preliminary interference estimation according to the International Radio Consultative Committee regulations for geostationary satellite networks sharing the same frequency band is applicable to any system regardless of signal form and modulation type, as well as regardless of the exact carrier frequency. A preliminary estimation involves determining the relative increment of equivalent noise temperature which is produced in one satellite channel by interference signals from another, assuming that an interference signal is equivalent to thermal noise of uniform spectral power density equal to the maximum disclosed in the application for license. Such preliminary estimates are based on fundamental relations for the useful signal in the presence of thermal noise with the intermodulation component of noise taken into account. These relations are derived here for satellite telephone channels in a system with frequency modulation of analog signals and with frequency division multiplex, in a system with phase keying of digital signals and time division multiplex, in a one channel per carrier system with pulse code modulation and phase keying. Author

N85-25587# Joint Publications Research Service, Arlington, Va.
SURVEY OF DEVELOPMENTS IN TROPOSPHERIC COMMUNICATION APPARATUS Abstract Only **c32**
A. S. Nemirovskiy and V. V. Markov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 50 refs Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 11, Nov. 1984 p 60 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

A new book was published by VOYENIZDAT at Moscow in 1984 Tropospheric Communication by L. T. Ykovlev, G. V. Dedyukin, P. I. Sututon and others. The book is based on material on this subject in foreign periodical and textbook literature. The book contains engineering and geographic data on worldwide existing and planned stationary tropospheric communication equipment. Tropospheric communication is compared with other modes of communication in terms of effectiveness, advantages and drawbacks. Particular attention is paid to tropospheric communication equipment needed in barely accessible polar, desert, and mountainous regions, to intercontinental tropospheric communication and to such communication between mainland and nearby islands. Much space is devoted to present development trends and projections for the future, including extensive bibliographic references. Author

N85-25588# Joint Publications Research Service, Arlington, Va.
EVALUATION OF ADEQUACY PF JP54 PROTECTION LEVEL FOR LARGE ELECTRIC MACHINES Abstract Only **c33**
L. A. Zbarskiy, B. Ye. Teplitskiy, and Yu. V. Porshnev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 53 Transl. into ENGLISH from Promyshlennaya Energetika (Moscow), no. 10, Oct. 1984 p 23-25 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

Testing large electric machines for adequacy of JP54 protection in contaminated atmospheres is difficult, because of a lack of large enough testing apparatus such as dust chambers and an adequate criteria for test data evaluation. Therefore, large machines must be broken and their vulnerable components be tested by appropriate simulation of the overall structure. Such tests were performed on 200-2000 kW 6-10 kV series VA02 squirrel cage induction motors with VZT4 or RV explosion proofing. Cement dust was used as a soft contaminator of stator insulation, its fine dispersion and high penetrating ability matching those of the worst natural contaminators. Insulation resistance and breakdown or surface flashover voltage were selected as safety criteria for this test. Silicon dust was used as a hard contaminator of the bearing lubricant, its coarse dispersion and high abrasiveness matching those of the worst natural contaminators. Shaft coasting time, relative to shaft coasting time in bail bearings with pure grease lubrication, served as a performance indicator in this test. Author

N85-25589# Joint Publications Research Service, Arlington, Va.
METHOD OF IMPROVING DYNAMIC CHARACTERISTICS OF DC VOLTAGE STABILIZERS WITH COMPOUND REGULATION Abstract Only **c33**
G. S. Stoyanov and L. F. Zakharov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 54 refs Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 8, Aug.

1984 p 52-53 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

A d.c. voltage stabilizer with compound regulation is considered, with continuous feedback and pulse width modulation. An improvement of its dynamic characteristics is proposed which will stabilize performance under both steady and transient conditions by making it independent, not only of the pulse width modulator transconductance, but also of the feedback amplifier gain. This is achieved by addition of a corrective network with two inputs and two outputs. Each output is connected to the input of a comparator, one containing a d.c. current amplifier and one containing a d.c. voltage amplifier. Each input is connected to the output of the corresponding amplifier. Furthermore, a current transducer is inserted into the continuous regulation channel and an LCD filter is inserted into the pulse regulation channel. A prototype of such a voltage stabilizer was tested with a 2 A step change of the load current and this corrective network reduced the constant component of voltage stabilization error from 10.485-1.25 mV to 0.30-1.07 mV over the 18-25 V range of input voltage. Author

N85-25590# Joint Publications Research Service, Arlington, Va.
QUALITY CONTROL OF RADIOELECTRONIC APPARATUS COMPONENTS ON BASIS OF EXTERNAL CHARACTERISTICS IN FREQUENCY DOMAIN Abstract Only **c33**
F. N. Pokrovskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 55 refs Transl. into ENGLISH from Izv. Vyssh. Zaved., Radioelektron. (Kiev), v. 27, no. 10, Oct. 1984 p 92-95 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

Measurement of impedances and other external parameters at several frequencies is proposed for unambiguous identification of radioelectronic apparatus components in the process of their quality control. The validity of this method is established upon transformation of a complex quantity such as impedance into a rational fractional function and subsequent polynomial series expansion of both numerator and denominator of the latter. This transformation of a measured quantity yields a linear equation containing a certain number of nonidentical groups whose vector can be arbitrarily normalized as is necessary for parametric identification of a given circuit. As an example demonstrating this procedure, inspection is considered of a high frequency (1 MHz) amplifier on a series R235UV1 integrated circuit chip for stability of performance characteristics in time as well as during fluctuations of ambient temperature and supply voltage, under humidity and under mechanical impact. A diagnostic chart is constructed for convenient fault detection and subsequent prevention in preceding stages of the production process. Author

N85-25591# Joint Publications Research Service, Arlington, Va.
CASCODE AND DIFFERENTIAL AMPLIFIER USING FIELD-EFFECT TRANSISTORS Abstract Only **c33**
N. Polyakov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 55-56 refs Transl. into ENGLISH from Radio (Moscow), no. 11, Nov. 1984 p 28-29 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

Because of the small coupling between the input and the output of field-effect transistor (FET) cascode amplifiers, a high gain and stability are obtained. The relative complexity and a large number of parts are their shortcomings. By experimenting with FET, a cascode amplifier was designed and constructed which requires almost no resistors and capacitors. This was possible by employing FETs with essentially different cut off voltages. Tests of the amplifier performance revealed good thermal stability. The electrical circuit of this amplifier is described and is shown along with a circuit for a cascode resonant RF amplifier for a medium wave direct amplification receiver. A differential amplifier was constructed and has many advantages for a variety of applications. Since it is powered by a unipolar source, it is calibrated at zero voltage for all three inputs and allows connecting any of the unused inputs to the common line. This design was used to construct AGC amplifiers, mixers in combination with heterodynes, or mixers with separate heterodynes. Author

N85-25592# Joint Publications Research Service, Arlington, Va.
STRUCTURIZATION OF PROGRAMS FOR REAL-TIME MICROPROCESSOR ARRAYS Abstract Only **c60**
B. M. Rakhimbekov and A. N. Varfolomeyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 57 refs Transl. into ENGLISH from Electrosvyaz (Moscow), no. 9, Sep. 1984 p 33-35 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

Resolution of an algorithm of system operation into several programs corresponding to system states at various definite instants of time is considered as a more expedient alternative for microprocessor arrays operating in real time. The feasibility of such a resolution is demonstrated for a microprocessor array operating in the synchronous mode. Comparative estimates for programming with and without such a resolution, based on semiempirical relations, indicate that resolution may increase the number of operators and correspondingly the instructions by 10% but will reduce the complexity of programs such more appreciably and the man days of programming as well, typically by a factor of 2.65 when programs for message switching systems are written in ASSEMBLER language by a programmer with average skill. Author

N85-25593# Joint Publications Research Service, Arlington, Va.
ACOUSTIC EMISSION OF SEMICONDUCTOR DEVICES Abstract Only **c71**
V. A. Kalitenko, I. Ya. Kucherov, and V. M. Perga *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 58 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Kiev), v. 27, no. 10, Oct. 1984 p 91-92 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

An experimental study was made of acoustic emission in semiconductor devices during current flow, especially preceding breakdown, for possible usefulness in stress analysis and nondestructive inspection. Batches of ten D302 germanium diodes and ten P201E germanium transistors were tested, in both cases the number of pulses per unit time being counted on an oscilloscope screen and on tape after their conversion to electric signals by a TsTS-19 piezoceramic transducer and subsequent amplification. Diode measurements included current and voltage drop, acoustic emission being found to occur at a forward current above the 2 A threshold and at a reverse current from 3.5 mA (threshold) to 5.5 mA (thermal breakdown). The transistors were tested in the common-emitter connection with resistance in the base circuit. Measurements included collector voltage and current with acoustic emission found to occur at a collector voltage of approximately 50 V and a collector current from 0.5 A (threshold) to 1.5-2.0 A (breakdown). Author

N85-25594# Joint Publications Research Service, Arlington, Va.
COMPUTER-AIDED IDENTIFICATION OF COMPLETE CONSTITUTION MODEL OF TRANSISTOR STRUCTURE FOR DESIGN OF SUBNANOSECOND LARGE-SCALE-INTEGRATED CIRCUITS Abstract Only **c33**
A. N. Bubennikov and A. D. Sadovnikov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 59 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Moscow), v. 27, no. 10, 15 Feb. 1984 p 46-51 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

Conputer programs were developed for two dimensional modeling of transistor structures with planar contact configuration in order to facilitate the design of LSI circuits with minimization of geometrical dimensions and identification of static and dynamic electrical characteristics throughout the technological process. These programs, TRAN 2 and TRAN 2M, are concerned with a transistor not only in the normal active mode but also in inversion and saturation states. Another specific application is subnanosecond LSI of emitter coupled logic in the unsaturated state.

Electron and hole concentrations as variable in the TRAN 2 program were replaced with the exponents of electron and hole Fermi quasi potentials, which symmetrizes with diagnol predominance the matrices of discretized continuity equations and thus facilitates the solution of the latter. Both programs yield all necessary current-voltage and capacitance-voltage characteristics as well as the dependence of the collector-emitter time constant and of the current transfer ratio on the collector voltage. Author

N85-25595# Joint Publications Research Service, Arlington, Va.
INSTRUMENT FOR MEASURING DISPERSIONAL DISTORTIONS IN OPTICAL FIBERS AND CABLES Abstract Only c35
Ya. V. Alishev, A. A. Maryenko, Yu. V. Smirnov, V. N. Uryadov, and V. I. Sinkevich *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 60 refs Transl. into ENGLISH from Electrosvyaz (Moscow), no. 9, Sep. 1984 p 43-44 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

An instrument was developed and built for measuring the dispersional distortions in optical fibers and cables on the basis of pulse widening. The instrument consists of a laser as a light source, a master oscillator, an optical transmitter, an optical shunt with mode mixer, an optical receiver, a fiber length measuring device, a smoothly adjustable delay line, and a stroboscopic oscillograph. The optical transmitter contains a semiconductor laser with GaAs-GaAlAs diheterostructure and modulator with pulse generating avalanche-breakdown transistors. The optical receiver contains a germanium photodiode with internal amplification and photoreceiver amplifier with microwave bipolar germanium transistors. Matching of the instrument to the tested fiber line is done by passing radiation into the latter from an auxiliary small He-Ne laser through a directional coupler. Author

N85-25596# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
9 Apr. 1985 171 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-009) Avail: NTIS HC A08/MF A01

Technology policy, marketing, and laser applications are discussed as well as computerized Chinese character processing and the development of robots. Environment protection and advances in health care are considered. For individual titles, see N85-25597 through N85-25599.

N85-25597# Joint Publications Research Service, Arlington, Va.
DEVELOPMENTS IN MICROELECTRONICS: PAST AND FUTURE c33
Li Zhijian *In* China Rept.: Sci. and Technol. (JPRS-CST-85-009) 9 Apr. 1985 p 62-66 Transl. into ENGLISH from Dianzi Xuebao (Beijing), no. 5, Sep. 1984 p 61-65 (For primary document see N85-25596 15-31)
Avail: NTIS HC A08/MF A01

The evolution of microelectronics in China is reviewed. Current developments and fracture trends seen as characteristic of the technology are discussed and some suggestions are offered as to the advancement of microelectronics in China. A.R.H.

N85-25598# Joint Publications Research Service, Arlington, Va.
FUTURE PROSPECTS OF CHINA'S MICROWAVE SEMICONDUCTOR TECHNOLOGY c33
Han Jihong *In* China Rept.: Sci. and Technol. (JPRS-CST-85-009) 9 Apr. 1985 p 67-70 refs Transl. into ENGLISH from Dianzi Xuebao (Beijing), no. 5, Sep. 1984 p 86-92 (For primary document see N85-25596 15-31)
Avail: NTIS HC A08/MF A01

The present level of semiconductor technology is reviewed. Important directions for guiding in-depth development are: microwave power synthesis technology, GaAs monolithic integrated circuits, and new type microwave semiconductor components. Efforts needed to overcome limitations in solid-state technology are discussed. The major reasons for the large gap in China's microwave semiconductor technology is the lack of interdisciplinary cooperation and of a major productive capacity. Emphasis must be shifted from scientific research to production. A.R.H.

N85-25599# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF ROBOTS, ROBOTICS DISCUSSED c37
Zhu Jianying *In* China Rept.: Sci. and Technol. (JPRS-CST-85-009) 9 Apr. 1985 p 92-110 refs Transl. into ENGLISH from Ziran Zazhi (Shanghai), no. 9, 1984 p 655-662 (For primary document see N85-25596 15-31)
Avail: NTIS HC A08/MF A01

The concepts of robot and robotics are defined. The status and development trends are discussed as well as the wide range of robot applications. Classifications of existing robots in the U.S. and Japan are considered. Coordinate systems and terminology used in robotics, basic problems in robotic kinetics, the rotational transformation matrix, and homogeneous transformation matrices are covered. Problem solving in robotic kinetics is examined. A.R.H.

N85-25600# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
21 Feb. 1984 44 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-007) Avail: NTIS HC A03/MF A01

West European progress on science and technology is reported. Topics discussed include: aerospace, automobile industry, biotechnology, factory automation, and microelectronics. For individual titles, see N85-25601 through N85-25605.

N85-25601# Joint Publications Research Service, Arlington, Va.
COSTS, PAYLOAD OF ARIANE, US SPACE SHUTTLE COMPARED c16
Roger E. Lo *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-007) 21 Feb. 1984 p 1-4 refs Transl. into ENGLISH from DFVLR-Nachr. (Cologne), Nov. 1983 p 33-36 (For primary document see N85-25600 15-31)
Avail: NTIS HC A03/MF A01

Performance and costs of Ariane and the Space Shuttle in transportation Satellites into geostationary orbit are compared. E.A.K.

N85-25602# Joint Publications Research Service, Arlington, Va.
MERCEDES-BENZ AUTO 2000 ACHIEVES LOW DRAG COEFFICIENT c02
Albert Hack and Ruediger Faul *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-007) 21 Feb. 1984 p 5-9 Transl. into ENGLISH from Automobil Ind. (Wuerzburg, West Germany), Sep. 1983 p 379-385 (For primary document see N85-25600 15-31)
Avail: NTIS HC A03/MF A01

Air resistance is one of the major considerations in motor-vehicle design when it comes to manufacturing cars with reduced energy consumption and hence lower costs. Measures taken toward the reduction of fuel consumption, however, are in conflict with a large number of engineering requirements. A drag coefficient of cD = 0.27 was achieved for the Daimler-Benz experimental car. This new car was created using some of the major bodywork components of the S Class Sedan which provided a good starting point with a cD of 0.36. It is noted that this low drag coefficient is obtained without making any compromises in the sensitivity to side winds. E.A.K.

N85-25603# Joint Publications Research Service, Arlington, Va.
STATUS OF FRENCH RESEARCH IN PLASTIC BATTERIES c33
Philippe Douroux *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-007) 21 Feb. 1984 p 10-11 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 15 Dec. 1983 p 11 (For primary document see N85-25600 15-31)
Avail: NTIS HC A03/MF A01

The development of the plastic battery is discussed. Its weight is divided by four and still retains the same power. As the lead acid battery. Its watertight properties and recharging speed are

very efficient. The success of plastic materials is based on the conductivity, and the electrochemical properties of polymers.
E.A.K.

N85-25604# Joint Publications Research Service, Arlington, Va.
PSA, RENAULT WORK ON ALL FUEL AUTOMOBILE ENGINE **c37**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-007) 21 Feb. 1984 p 12 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 12 Jan. 1984 p 11 (For primary document see N85-25600 15-31)
Avail: NTIS HC A03/MF A01

An any mixture engine capable of using any fuel from pure gasoline to 100% alcohol is discussed. A traditional 2-liter displacement engine was equipped with an electronic injection system which receives and processed data concerning the nature of the fuel. The principle selected consists in varying the air intake as a function of the alcohol contents of the mixture. To determine the percentage of alcohol in the mixture, three methods were developed: (1) detection of the titer by using the absorption properties of the optical radiation of the mixture; (2) processing of the tank input data by magnetic card; and (3) measurement of the richness of the intake fuel by a sensor installed in the exhaust. A prototype ignition system associatd to the engine knock by a vibration sensor and to optimum combustion through ionization sensors is used. E.A.K.

N85-25605# Joint Publications Research Service, Arlington, Va.
ROBOT USE IN FRG INCREASES BUT SENSOR TECHNOLOGY LAGS **c37**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-007) 21 Feb. 1984 p 30 Transl. into ENGLISH from VDI Nachr. (Duesseldorf) 6 Jan. 1984 p 1 (For primary document see N85-25600 15-31)
Avail: NTIS HC A03/MF A01

More than 4,800 industrial robots were installed in Germany (FRG). Japan improved its leading position; the increases from 5,000 to a currently estimated 17,000 robots alone is just as great as the total utilization volume in the FRG. The greatest relative increase was recorded in the assembly field. So long as the periphery problems are not solved, an explosion in the assembly work sector is really impossible. This elminates a threat to many jobs. The expansion effort still fails because of the absence of sensors in casting cleaning and deburring. The robot industry continues to believe in its growth. By the end of 1984, 6,000 industrial robots in the FRG are predicted. E.A.K.

N85-25606# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
29 Feb. 1984 61 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-008) Avail: NTIS HC A04/MF A01

This West Europe report presents research findings in many areas of science and technology. Areas of study include: (1) advanced materials; (2) aerospace activities; and (3) metallurgical industries. For individual titles, see N85-25607 through N85-25611.

N85-25607# Joint Publications Research Service, Arlington, Va.
PECHINEY STRATEGY INCLUDES DEVELOPMENT OF NEW MATERIALS **c24**
Jean Roume *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-4-008) 29 Feb. 1984 p 1-2 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 19 Jan. 1984 p 35 (For primary document see N85-25606 15-31)
Avail: NTIS HC A04/MF A01

The development of new and advanced materials at the Pechiney Co., in France is the topic of this report. The development of an industrial prototype for the production of new aluminum-lithium alloys is discussed. Another major avenue of research that holds great promise is that of composite materials. Advances are being made in the domain of composites comprised of fibers or aluminum-oxide and boron powders in association with aluminum or aluminum-lithium matrices. B.W.

N85-25608# Joint Publications Research Service, Arlington, Va.
EUROPEAN VIEWS DIFFER ON SPACE STATION CONCEPT **c18**
Guenter Paul *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-008) 29 Feb. 1984 p 3-5 Transl. into ENGLISH from Frankfurter Allgem. Zeitung (Frnakfurt/Main), 11 Jan. 1984 p 25 (For primary document see N85-25606 15-31)
Avail: NTIS HC A04/MF A01

The Spacelab with the German astronaut Ulf Merbold on board was—for ESA, the European Space Agency—a first step on the way to manned space travel. Two major projects are under discussion for the late 1980's and the 1990's. The French are in favor for the development of a rocket engine powered with liquid hydrogen and liquid oxygen which would have a thrust of about 100 tons. With this engine it would be possible to build rockets which, by the middle of the 1990's, could carry 15 tons of payload in a low Earth orbit or 8 tons in a transition orbit for placement in a stationary earth orbit position. The federal Republic of Germany on the other hand seems of prefer the construction of European space station or the participation of the Europeans in an American space station. Together with Italy, Germany designed such a station by the name Columbus; it also uses the structural components of Spacelab, of SPAS (Shuttle Pallet Satellite) which was placed in position last June by the Space Shuttle and which was then retrieved. B.W.

N85-25609# Joint Publications Research Service, Arlington, Va.
MBB/ERNO'S VIEWS, FUTURE PLANS IN AEROSPACE ACTIVITIES **c12**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-008) 29 Feb. 1984 p 6-7 Transl. into ENGLISH from Frankfurter Allgem. Zeitung (Frankfurt/Main), 20 Jan. 1984 p 15 (For primary document see N85-25606 15-31)
Avail: NTIS HC A04/MF A01

MBB Erno's future plans in aerospace activities are explained. The second Spacelab is already being built in the workshops in Bremen. The payload is currently being prepared for installation in the system for the first German spacelab mission which is scheduled for December 1985. MBB/Erno is again building the first retrievable and free flying experimental platform called Eureca (European Retrievable Carrier). B.W.

N85-25610# Joint Publications Research Service, Arlington, Va.
SWEDEN DEVELOPS NEW RAPID SOLIDIFICATION PROCESS **c26**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-008) 29 Feb. 1984 p 13-16 Transl. into ENGLISH from Teknik i Tiden (Stockholm), Autumn 1983 p 12-13 (For primary document see N85-25606 15-31)
Avail: NTIS HC A04/MF A01

Rapid solidification process produces new materials possessing new properties. A 5-year program is being launched in this field, giving Sweden an opportunity to spearhead research the new process can be used for new aluminum and copper alloys with better mechanical properties at high temperatures. Using the rapid solidification process, superalloys with nickel and cobalt can be made more malleable - a quality usually lacking in some of them. B.W.

N85-25611# Joint Publications Research Service, Arlington, Va.
FRANCE DEVELOPS NEW CONTINUOUS VACUUM TREATMENT METHOD **c26**
Jean Nenin *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-008) 29 Feb. 1984 p 17-19 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 26 Jan. 1984 p 72-73 (For primary document see N85-25606 15-31)
Avail: NTIS HC A04/MF A01

The development of a continuous vacuum furnace is described. Capable of heat treating 250 kg of parts per hour, the furnace is the first of its kind in France. The processing assembly includes

the furnace proper plus, upstream from the furnace, an ultrasonic cleaning facility and the charging lock-chamber and, downstream, the hardening lock-chamber with its controlled atmosphere, which also acts as an unloading chamber. The components are connected to one another, and the lock-chambers to the outside through tight doors. The facility layout was completed late in the summer of 1983 and industrial-scale testing began on unit and mass-produced parts. The parts treated included quick fittings made of Z-30-C-13 stainless steel and computer disk blanks made of Z-100-CD-17 steel (the latter at the rate of 5,000 per week). B.W.

N85-25612# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
17 Aug. 1984 51 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-027) Avail: NTIS HC A04/MF A01

Announcements in science and technology in western European countries are given. Some subject areas covered are: aerospace, automobile industry, civil aviation, factory automation, microelectronics and technology transfer. For individual titles, see N85-25613 through N85-25616.

N85-25613# Joint Publications Research Service, Arlington, Va.
FRANCE OFFICIALLY PROPOSES DEVELOPMENT OF ARIANE 5 TO ESA **c15**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-027) 17 Aug. 1984 p 3-9 Transl. into ENGLISH from AFP Sci. (Paris), 21 Jun. 1984 p 10-15 (For primary document see N85-25612 15-31)
Avail: NTIS HC A04/MF A01

France's proposal to start preliminary studies on the LOX-LH2 (liquid oxygen-liquid hydrogen) fueled cryogenic engine HM 60 and Ariane 5 is announced. The decision signifies the development of a launcher capable of lifting heavy payloads and manned minishuttles into orbit. France also confirmed its participation in the European radar observation satellite ERS 1, which is to be designed for experiments on radar observation techniques and for oceanographic and climatological programs. E.R.

N85-25614# Joint Publications Research Service, Arlington, Va.
SEP OF FRANCE TO MAKE ARIANE HM-60 CRYOGENIC ENGINE **c20**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-027) 17 Aug. 1984 p 12-15 Transl. into ENGLISH from AFP Sci. (Paris), 12 Jul. 1984 p 14-17 (For primary document see N85-25612 15-31)
Avail: NTIS HC A04/MF A01

The manufacturing and assembling plans for the Ariane rocket engine by SEP (European Propulsion Co.) is discussed. The HM-60 engine program is briefly discussed. Also presented is the plans for a five year research and development plan with the partners of ESA. Provisional characteristics of the HM-60 engine are outlined. E.R.

N85-25615# Joint Publications Research Service, Arlington, Va.
NICKEL-IRON BATTERY TO BE USED IN PEUGEOT ELECTRIC CAR **c33**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-027) 17 Aug. 1984 p 16-17 Transl. into ENGLISH from Le Monde (Paris), 1 Jun. 1984 p 18 (For primary document see N85-25612 15-31)
Avail: NTIS HC A04/MF A01

The introduction of an electrically driven vehicle by the Peugeot group is announced. This is made possible by the development of a new nickel-iron battery. Advantages of this battery including weight and size reduction and improved life are briefly discussed. E.R.

N85-25616# Joint Publications Research Service, Arlington, Va.
MBB COST-REDUCTION PLAN FOR AIRBUS CONSTRUCTION DESCRIBED **c01**
Klaus Wiborg *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-027) 17 Aug. 1984 p 18-20 Transl. into ENGLISH from Franfurter Allgem. Zeitung (Frankfurt am Main), 8 Jun. 1984 p 18 (For primary document see N85-25612 15-31)
Avail: NTIS HC A04/MF A01

The economics of designing and producing a competitive major passenger aircraft is explored. Factors involved are producing an aircraft at economically acceptable cost and keeping pace with competition in terms of quality as well as manufacturing hours and manufacturing cost. The economics of manufacturing a plane in one or two plant site as opposed to several plant sites is examined. E.R.

N85-25617# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
1 Aug. 1984 75 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-026) Avail: NTIS HC A04/MF A01

Research developments in the areas of aerospace and computers are discussed in this West Europe Report. Specific topics discussed include: (1) Spacelab benefits; (2) Ariane 5 launcher description; (3) German lanugage software development; and (4) optical data storage materials. For individual titles, see N85-25618 through N85-25620.

N85-25618# Joint Publications Research Service, Arlington, Va.
FRG OPINION ON SPACELAB BENEFITS, SPACE STATION PARTICIPATION **c12**
Berndt Feuerbacher *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-026) 1 Aug. 1984 p 1-8 Transl. into ENGLISH from Bild der Wiss. (Stuttgart), May 1984 p 48-55 (For primary document see N85-25617 15-31)
Avail: NTIS HC A04/MF A01

The scientific benefits of Spacelab are examined and documented. The historic role of spacelab in manned space flight is explored. Plans for future spacelab flights are discussed in terms of research needs. German participation in the development of a permanent space station is also discussed. Cost effectiveness is seen as a major consideration in space station development. B.W.

N85-25619# Joint Publications Research Service, Arlington, Va.
FRENCH CNES OFFICIAL DESCRIBES ARIANE V LAUNCHER **c15**
R. Vignelles *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-026) 1 Aug. 1984 p 9-26 Transl. into ENGLISH from L'Aeron. et l'Astronautique (Paris), no. 105, Feb. 1984 p 24-31 Original language doc. previously announced in IAA as A85-10538 (For primary document see N85-25617 15-31)
Avail: NTIS HC A04/MF A01

The need for a new and larger version of the ESA Ariane-4 launch vehicle is examined, taking the present situation and future trends in the LEO, SSO, and GTO markets into account; the principal characteristics required of a future launcher are discussed (payload mass and dimensions, reliability, safety, and potential for furhter development); and the three proposed A-5 configurations are characterized and illustrated with drawings. The A-5R is based on the A-44L, replacing its second stage with one using the HM60 large cryogenic engine being developed by ESA. The A-5C employs four HM60s in its first stage and one HM60 in its (optional) second stage, while the A-5P has one single-HM60 stage and two 150-tonne solid-propellant boosters. The technical and economic factors to be weighed in choosing one of these configurations are considered. T.K. (IAA)

N85-25620# Joint Publications Research Service, Arlington, Va.
PHILIPS TESTED NEW MATERIALS FOR OPTICAL DATA STORAGE **c82**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-026) 1 Aug. 1984 p 29-30 Transl. into ENGLISH from Frankfurter Zeitung/Blick Durch die Wirtsch. (Franfurt am Main), 4 Jun. 1984 p 7 (For primary document see N85-25617 15-31)
Avail: NTIS HC A04/MF A01

Tellurium selenium alloys, organic compounds and magnetic optical materials are being tested for use in optical recording systems. Digital data (alphanumeric data and digital audio informa-

tion) or video information as well can be stored depending on the material used. The advantages are fast access time and very large storage capacity. One such disk with about a 30-cm diameter can hold more than one gigabyte. According to Philips, this is equivalent to the contents of about a half-million typewriter pages in the A4 DIN format. These storage materials are embedded in an electro-optical recording disk about the size of an LP record. A certain physical effect is produced by a laser upon readout as a function of the recording material used; the information contained in it is made available in coded form. The type of material also determines whether data or video information as well can be stored. B.W.

N85-25621# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
15 Mar. 1985 165 p Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-007) Avail: NTIS HC A08/MF A01

Progress in science and technology in the People's Republic of China is reported topics discussed include: applied sciences, life sciences, environmental quality; and abstracts on astronautics, engineering, lasers, optics, and surgery. For individual titles, see N85-25622 through N85-25623.

N85-25622# Joint Publications Research Service, Arlington, Va.
MICROPROCESSOR CONTROLLED STORAGE SAMPLING OSCILLOSCOPE c33
Zhang Guangming and Chen Yaochi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-007) 15 Mar. 1985 p 27-30 refs Transl. into ENGLISH from Jisuanji Yanjiu Yu Fazhan (Beijing, China), no. 1, 1984 p 50-51 (For primary document see N85-25621 15-31)
Avail: NTIS HC A08/MF A01

The development of microprocessors in China to update electronic instruments and to improve the functions, accuracy and reliability of electronic instruments is discussed. A microprocessor was added to the oscilloscope and developed the CSQ-8001 intelligent instrument. Problems of how to apply a microprocessor to an oscilloscope were resolved in this instrument and its functions were carried out through software: measuring, digitizing the display and the data processing necessary for imaging processes. Peripheral equipment is added to improve the use of the main computer. The preprogramming functions method is used in the control of CSQ-8001; handbook operation expanded functional flexibility; digital automatic synchronous circuits are stable and reliable; the sampling technology covers a very broad passband (800 MC). The range of application of this oscilloscope is broad, it is reliable and easy to duplicate. E.A.K.

N85-25623# Joint Publications Research Service, Arlington, Va.
PROFESSIONAL COMMITTEE ON SOLID PROPULSION HOLD CONFERENCE c35
In its China Rept.: Sci. and Technol. (JPRS-CST-85-007) 15 Mar. 1985 p 41-46 refs Transl. into ENGLISH from Yuhang Xuebao (Beijing, China), no. 2, 30 apr. 1984 p 91 (For primary document see N85-25621 15-31)
Avail: NTIS HC A08/MF A01

The structure, technical features and performance of the ZJ-1113 beryllium window proportional counter with a thickness of 0.1 mm and an active area of 81 sq cm 2 are described. The counter has a high energy resolution, wide linear range, high detection efficiency and a long lifetime. The model ZJ-1113 large-area beryllium window proportional counter is used for the detection of low energy cosmic X-rays. A new class of space objects, the X-ray sources, were discovered. The atmosphere does not transmit X-ray and the experiments must be conducted outside the atmosphere in which the beryllium window proportional counter is a powerful tool in the study of X-ray astronomy. The large area beryllium proportional counter has a closed structure and functions reliably. Its energy resolving power is high and its range of linear response is wide. It is suited for measuring lower energy X-ray and gamma ray. E.A.K.

N85-25624# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
24 May 1985 61 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-84-016) Avail: NTIS HC A04/MF A01

New items, abstracts, and scientific reports on aspects of science and technology including flight tests of experimental shuttle craft; titanium alloys; integrated circuits; CMOS; computer industry; and laboratory animals for pharmaceutical research are contained. For individual titles, see N85-25625 through N85-25632.

N85-25625# Joint Publications Research Service, Arlington, Va.
FLIGHT TESTS OF EXPERIMENTAL SHUTTLE CRAFT DESCRIBED c16
Miroslaw Frydrych *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 1-2 refs Transl. into ENGLISH from Technika Lotnicza i Astronautyczna (Warsaw), no. 3, Mar. 1984 p 13 (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

On March 15, 1983, the Soviet Union tested a shuttle craft in space. The Soviet shuttle craft is a supersonic glide aircraft and is very similar to the experimental vehicles tested in the 1970's: the German LB 21 Bumerang and the American HL 10 Lifting Body. The American and Soviet shuttle crafts are compared. B.G.

N85-25626# Joint Publications Research Service, Arlington, Va.
TITANIUM ALLOYS, PRODUCTS, STANDARDS LISTED c26
Stanislaw Ksiazek *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 3-8 Transl. into ENGLISH from Technika Lotnicza i Astronautyczna (Warsaw), no. 3, Mar. 1984 p 22-23 (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

Titanium and titanium alloys, materials originally used in construction of rockets and aircraft, are being expanded to other fields of technology. The alloys used are imported from the Soviet Union. The chemical compositions and mechanical properties are listed. Forgings of bars, sheet metal, and tubing are discussed. B.G.

N85-25627# Joint Publications Research Service, Arlington, Va.
ASPECTS OF CSSR CMOS INTEGRATED CIRCUITS DISCUSSED c33
Jaroslav Kruml *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 9-21 refs Transl. into ENGLISH from Sdelovaci Technika (Prague), no. 10, 1983 p 365-368 (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

The technical characteristics of the main series of unipolar CMOS circuits are surveyed. The CMOS integrated circuits are a large group of unipolar circuits with complementary type N and type P channels. The parameters of transistor-transistor logic (TTL) circuits and CMOS circuits are computed. B.G.

N85-25628# Joint Publications Research Service, Arlington, Va.
RECENT DEVELOPMENTS c33
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 21-22 Transl. into ENGLISH from Sdelovaci Technika (Prague), no. 10, 1983 p 368 (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

The CMOS technology was originally designed for equipment with limited power supply capacity, and its only original advantage was its lower power consumption. Innovations have resulted in the present compatibility of CMOS with bipolar technology in small and medium scale integrated circuits and with unipolar technologies in large scale and very large scale integrations. The main limiting factor remains the power which the package is capable of dissipating. Applications of CMOS circuits in technology are discussed. B.G.

N85-25629# Joint Publications Research Service, Arlington, Va.
MHB4046 PHASE-LOCK CIRCUIT c33

Miroslav Jezek *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 22-27 ref Transl. into ENGLISH from Sdelovaci Technika (Prague), no. 10, 1983 p 369-370 (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

The MHB4046 integrated circuit is a phase lock circuit equivalent to foreign circuits with the same number designation. The main characteristics and applications, particularly in connection with a phase comparator are described. The MBH4046 circuit contains a voltage-controlled oscillator (VCO), two phase comparators, an emitter follower, a circuit for automatic creation of an offset with capacitive connection of the signal, and an independent zener diode with a power supply requirement of about 7V. B.G.

N85-25630# Joint Publications Research Service, Arlington, Va.
IMPROVED, CHEAPER SIPMOS CIRCUITS NO. 10, 1983 P 370 **c33**
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 27-28 ref Transl. into ENGLISH from Sdelovaci Technika (Prague), (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

The MOS power transistors were already on the market for more than 3 years. But in spite of their unquestioned superiority, they have not taken over the field below 500 V. The reason is that they cost more than bipolar transistors. Siemens has now succeeded in improving its production technology to the point that the chips for low-voltage transistors have half the surface area with the same power. This improves their electrical characteristics and decreases their price. The new production technology has increased current density. Below 200 V, the permissible current draw is now doubled. The double ion implantation of the channel regions has remained unchanged, but the regions are shorter, so that more transistors can be placed on this chip. Author

N85-25631# Joint Publications Research Service, Arlington, Va.
PHASE-LOCKED LOOP DESIGN WITH MHB4046 **c33**
Pavel Hasan *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 29-36 refs Transl. into ENGLISH from Sdelovaci Technika (Prague), no. 10, 1983 p 371-373 (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

The design of phase locked loops (PPL) using the CMOS integrated circuit with the type designation MHB4046 is described. The circuit contains a phase detector called a charge pump circuit. The functioning of the charge pump PPL, the main equations which apply in the linear mode, and the design method are examined. The diverse applications of the MHB4046 are illustrated by two examples of PLL's with different properties. B.G.

N85-25632# Joint Publications Research Service, Arlington, Va.
ADDITIONAL PLL DESIGNS **c33**
Vladimir Vachala *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 37-49 refs Transl. into ENGLISH from Sdelovaci Technika (Prague), no. 10, 1983 p 375-378 (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

The catalogs of several companies and the specialized literature make it clear that the CD4046 integrated circuit and its equivalents such as the MHB4046, the MC14046B and the HEF4046B, as well as the modernized HC/HCT4046, are among the most commonly used versions. Their applications include frequency synthesis, FM demodulation, voltage-frequency conversion and the like. For higher frequencies the alternative HCTR0320 may be considered. Since phase-locked loops (PLL) are used in this country, their most important properties, useful information on the specifications of the most important auxiliary components, and details of circuitry are described in order to simplify their incorporation. Author

N85-25633# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
18 Jun. 1984 89 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-020) Avail: NTIS HC A05/MF A01

Advances are reported in: (1) the development of carbon fibers and ceramics in France; (2) the production of an aluminum lithium alloy in the United Kingdom; and (3) the use of robotics in Italy and France. Belgium participation in the A-320 program is also discussed. For individual titles, see N85-25634 through N85-25634.

N85-25634# Joint Publications Research Service, Arlington, Va.
GLASS, CARBON FIBERS MADE AT FIBRE ET MICA IN FRANCE **c27**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-020) 18 Jun. 1984 p 3-5 Transl. into ENGLISH from Ind. et Tech. (Paris), 10 Apr. 1984 p 34-35 (For primary document see N85-25633 15-31)
Avail: NTIS HC A05/MF A01

For the fabrication of composite material structures, the most universally used and cost effective technique is the filament winding process a method used by Fibre at Mica, at Villeurbanne, for over 20 years. The firm is fully equipped to make any and all bodies of revolution: eight winding machines, starting from glass fiber rovings, carbon-fiber rovings or aramide fiber rovings; thence, cylinders 6 meters long and 2 meters in diameter; and six impregnators, two of which are dedicated to the production of unidirectional carbon fiber sheets. Their top of the line composites are used for nozzles and brake discs. Unidirectional sheets and carbon-carbon structural rods are also produced. Production of small diameter tubing for electrical insulation for civilian markets is underway. A.R.H.

N85-25635# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
16 Jan. 1984 66 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-003) Avail: NTIS HC A04/MF A01

The development of composite ceramics in France and the production of ceramic parts for diesel engines in Italy are reported. The status and future of the Airbus program are discussed as well as advances in microelectronics and industrial policies in these and other Western European countries. For individual titles, see N85-25636 through N85-25638.

N85-25636# Joint Publications Research Service, Arlington, Va.
FRANCE DEVELOPS OWN ALUMINUM-BASED COMPOSITE CERAMIC **c27**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-003) 16 Jan. 1984 p 1-2 Transl. into ENGLISH from Ind. & Tech. (Paris), 1 Sep. 1984 p 9-10 (For primary document see N85-25635 15-31)
Avail: NTIS HC A04/MF A01

Aluminalon, is a composite material based on aluminum oxide, with dispersion being provided by BN hexagonal boron nitride or Y aluminum oxynitride produced in situ. This ceramic composite, developed in France, is completely competitive with other composite materials and is made from nonstrategic materials with a relatively low cost, even when high purity is required. However, the production method used is rather costly since compressors capable of achieving several Kbars at 1,500 to 2,000 degrees are uncommon. Aluminalon with a sufficiently high density may soon be produced using cold compression followed by heating at high temperature at ambient temperature, the properties of the aluminuim oxide/aluminum oxynitride composite are those of a good grade of a good grade of aluminum oxide. Better behavior is exibited at 1,400 deg. Oxidation resistance at 1,200 deg is remarkable. A.R.H.

N85-25637# Joint Publications Research Service, Arlington, Va.
FIAT CONDUCTS R AND D IN CERAMIC PARTS FOR DIESEL ENGINE **c27**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-003) 16 Jan. 1984 p 3-5 Transl. into ENGLISH from Sci. e Vita (Milan), Jun. 1983 p 100 (For primary document see N85-25635 15-31)

Avail: NTIS HC A04/MF A01

Silicon nitride can be sinterized either under hot pressure, starting with silicon nitride powder, or for reaction sintering, which uses only silicon dusts the nitrogen being added after the reaction phase; during the period while the material is being cooked. The economic advantages inherent of using reaction sintering are explorer and the process is explained. Pressure-sintered silicon is highly resistant to tensional stress, close to the levels by reaction sintering is, in this case, markedly inferior in strength. However, once the temperature rises above 1400 C, reaction-sintered silicon nitride outclasses even the strongest metals in mechanical strength. Precombustion chambers, piston sleeves, and preheating spark plugs are being produced and suffer no effects from mechanical and thermal stresses. A.R.H.

N85-25638# Joint Publications Research Service, Arlington, Va.
FRG JOURNAL ANALYZES STATE, PROSPECTS OF AIRBUS PROGRAMS: GENERAL ANALYSIS **c01**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-003) 16 Jan. 1984 p 10-16 Transl. into ENGLISH from Handelsblatt (Dusseldorf), 25/26 Nov. 1983 p 25 (For primary document see N85-25635 15-31)
Avail: NTIS HC A04/MF A01

Despite lagging sales and increased production cost of the the A300 and A310, airbus partners are urging the governments in Bonn, Paris, and London to subsidize a smaller model, the A320 with about 150 passenger seats. Management and organizational deficiencies in Airbus Industrie are becoming apparent in the current critical phase by a lack of timely adaptation to changing market conditions. Federal loans approved by the Bonn government, the British controversy over lending 500 million pounds, and the market potential for the A320 following McDonnell Douglas' decision to terminate development of two civil aircraft types are discussed. A.R.H.

N85-25639# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
21 Mar. 1984 63 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-009) Avail: NTIS HC A04/MF A01

Various topics relative to European science and technology are discussed. The automobile industry, an Airbus market survey, computers, computer aided manufacturing, spacecraft propulsion, and microelectronics are among the topics covered. For individual titles, see N85-25640 through N85-25643.

N85-25640# Joint Publications Research Service, Arlington, Va.
DETAILS ON SPOT REMOTE SENSING SATELLITE PROPULSION UNIT **c15**
J. C. Corai *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-009) 21 Mar. 1984 p 1-18 Transl. into ENGLISH from L'Aeron. et l'Astronautique (Paris), no. 103, Jun. 1983 p 32-40 (For primary document see N85-25639 15-31)
Avail: NTIS HC A04/MF A01

The SPOT propulsion system is described. The SPOT platform includes a propulsion module equipped with a hydrazine reaction control system (RCD). This RCS belongs to the attitude and orbit control system. It comprises essentially two branches of catalytic thrusters fed by surface tension tanks through a circuit providing their interconnection by latching insulation valves. It operates in blow-down mode. Each equipment is qualified individually. R.J.F.

N85-25641# Joint Publications Research Service, Arlington, Va.
FRENCH FIRM PLANS RECAPTURE OF DOMESTIC CAD/CAM MARKET **c61**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-009) 21 Mar. 1984 p 38-39 Transl. into ENGLISH from Electron. Actualites (Paris), 13 Jan. 1984 p 3 (For primary document see N85-25639 15-31)
Avail: NTIS HC A04/MF A01

The plans of the French firm CISI to recapture the computer aided design/computer aided manufacturing (CAD/CAM) market are discussed. CISI chose to invest as an overriding priority in CAD/CAM of industrial products, and is bringing out a STRIM [Tridimensional System for the Mechanical Industry]-100 line of software for the mechanical industry. With this plan, CISI is making its bid as a candidate for the recapture of the domestic CAD/CAM market, a market that is currently being covered to the extent of 80 percent by foreign products. CISI's decision to give priority to CAD/CAM as a development effort is based on the analysis made by the firm regarding the future of data processing. Whereas the activity of the data processing sector's industrial firms over the past 20 years centered essentially on the manipulation of alpha-numerical characters, CISI expects that, over the next 10 years, it will be centered on the operational handling of objects and of manufacturing plants; CISI emphasizes, moreover, that this second boom will be as substantial as the first. R.J.F.

N85-25642# Joint Publications Research Service, Arlington, Va.
FRENCH CONSULTING FIRM DEVELOPS OWN ROBOTICS **c37**
Andre Larane *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-009) 21 Mar. 1984 p 40-42 Transl. into ENGLISH from Ind. et Tech. (Paris), 10 Oct. 1983 p 23-26 (For primary document see N85-25639 15-31)
Avail: NTIS HC A04/MF A01

The Saint Gobain Group has at its disposal an independent test unit which carries out robotization feasibility tests for its various subsidiaries. From foundry to household appliances, through packaging, insulation and glass, the areas concerned are very diverse, and the range is further increased by including outside firms in the areas of agricultural products, electric applicances, plumbing, etc. The most promising device is the Versatile Automatic Prehensor, so named because it allows any articulated arm to change hands at will, and of course without human intervention. A type of wrist is fixed to the end of the arm by means of a suitable plate. The gripping tools necessary for the work cycle are arranged on a rack. The wrist is fixed automatically on the required tool and transmits to it the fluids needed: electricity, water, compressed air, or a vacuum. R.J.F.

N85-25643# Joint Publications Research Service, Arlington, Va.
ITALY INVENTS ROBOT TO COMPETE WITH ASEA, HITACHI **c37**
Carlo Arcari *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-009) 21 Mar. 1984 p 43-44 Transl. into ENGLISH from Mondo Economico (Milan), 3 Nov. 1983 p 68-69 (For primary document see N85-25639 15-31)
Avail: NTIS HC A04/MF A01

As a result of a number of front-rank developments (including Robbin, a pair of robots that handle a continuous synthetic spinning system in the Anic plant in Pisticci), Savio, a company of the ENI group that operates in the mechanical-textile sector, and the Primo group, which specializes in application of industrial robots in the automobile sector, established a new corporation. It is called Sapri and aims primarily at spreading the automatic factory within the textile industry. Sapri will draw on the extensive knowhow of the two composing companies and will not limit its efforts to the textile sector, but will also try to assert itself in areas not thus far affected by robot technology. In addition to Earnest-One, the articulated robot that cost Savio 2 years of research, there are Jack-One, a low-cost simple manipulator; Star, a handling robot that can operate along a structure up to 20 meters long; and Speedy, a rapid handler of small-dimension objects. Another application in which the Savio robot is developing an interesting market is in adhesive and sealant operations. R.J.F.

N85-25644# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
27 Mar. 1985 65 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-010) Avail: NTIS HC A04/MF A01

News items, abstracts, and scientific reports on aspects of science and technology including microelectronics, industrial policies, advanced materials, aerospace engineering, civil aviation,

biotechnology, and automobile industry are given. For individual titles, see N85-25645 through N85-25646.

N85-25645# Joint Publications Research Service, Arlington, Va.
SWEDEN INVENTS NEW CERAMIC FOR MORE DURABLE CUTTING TOOLS **c27**
Lars Pekka *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-010) 27 Mar. 1985 p 1-2 refs Transl. into ENGLISH from Ny Tek. (Stockholm), 15 Dec. 1983 p 27 (For primary document see N85-25644 15-31)
Avail: NTIS HC A04/MF A01

A silicon nitride based ceramic, produced by hot isostatic pressing, is being used to replace machine steel for turning castings and other material that causes heavy wear on the tool. Silicon nitride is highly resistant to wear and high temperatures, as well as thermal shock. Disc brakes are made from cast iron using oxide ceramic tools. The possible advantages of the silicon nitride ceramic over the oxide ceramic are discussed. B.G.

N85-25646# Joint Publications Research Service, Arlington, Va.
BIOENERGY, SOLAR BIOTECH RESEARCH IN FRANCE, EUROPE **c44**
M. F. Chevallier and R. Nussbaum *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-010) 27 Mar. 1985 p 10-29 refs Transl. into ENGLISH from Biofutur (Paris), Nov. 1983 p 27-36 (For primary document see N85-25644 15-31)
Avail: NTIS HC A04/MF A01

Advantages of unicellular photosynthetic systems, efficiency of photosynthetic conversion, Dunaliella Alga and biosynthesis of glycerol, applications for hydrocarbons, continuous cultures, immobilized cultures, culture techniques, and solar biotechnology are discussed. B.G.

N85-25647# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
4 May 1984 61 p Tranl. into ENGLISH from various West European articles
(JPRS-WST-84-014) Avail: NTIS HC A04/MF A01

Progress in West European Science and technology is reported. The particular areas discussed include: advanced materials, automobile industry, civil aviation, computers, factory automation, microelectronics, and scientific and industrial policy. For individual titles, see N85-25648 through N85-25651.

N85-25648# Joint Publications Research Service, Arlington, Va.
NEW MATERIAL, PROCESS SPINS OFF FROM VOLVO LCP 2000 PROGRAM **c27**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-014) 4 May 1984 p 1-3 Transl. into ENGLISH from Plastforum Scandinavia (Helsinborg), No. 1/2, 1984 p 46-47 (For primary document see N85-25647 15-31)
Avail: NTIS HC A04/MF A01

The light component project (LCP), to develop an improved method of wet hot molding is discussed. A new construction material and a new production method were developed. The hot molding technique was tested and it is found that the placement and distribution of the glass fiber reinforcement in the molded product can be predetermined. The method requires a short cycle time, and a lower investment than the sheet molding compound technique. E.A.K.

N85-25649# Joint Publications Research Service, Arlington, Va.
FINANCIAL, ECONOMIC COMMENTARY ON AIRBUS, EUROPEAN AVIATION **c01**
Philippe Gazier and Jean Gloguen *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-014) 4 May 1984 p 16-20 Transl. into ENGLISH from Nouvel Economiste (Paris), 5 Mar. 1984 p 66-70 (For primary document see N85-25647 15-31)
Avail: NTIS HC A04/MF A01

The development of the new European Airbus A320 is discussed. The economic risks and benefits are outlined. Its benefit to the European civilian aerospace industry in its competition with U.S. aircraft industries is enumerated. E.A.K.

N85-25650# Joint Publications Research Service, Arlington, Va.
ITALY'S FIAT USES SWEDEN'S ASEA SEEING ROBOT **c37**
C. Ar *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-014) 4 May 1984 p 35-36 Transl. into ENGLISH from Mondo Economico (Milan), 22 Mar. 1984 p 73 (For primary document see N85-25647 15-31)
Avail: NTIS HC A04/MF A01

The development and application of the seeing robots is discussed. The manipulator robot is equipped with a vision system and in less than a second is able to recognize and process up to eight different items arranged in quantity on a transporting belt. The robot does not need any special illumination to operate. A good ambient light is adequate, and it operates by analyzing contrast between at least 64 shades of gray. The robot demonstrates how vision solves particular problems of organization of work flow. A blind robot that has to handle eight different versions of a part requires eight storages, eight manipulation points, and appropriate supply systems. The seeing robot works with one conveyor and a single storage that holds various parts in bulk. The telecamera's eye is fixed and recognizes the objects when they stop in the collection area. The robot receives from the eye the coordinates and the data it uses to move to grasp the object at the correct position. E.A.K.

N85-25651# Joint Publications Research Service, Arlington, Va.
CRITERIA FOR QUALIFYING FOR FRG FEDERAL CAD/CAM SUBSIDIES **c61**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-014) 4 May 1984 p 52-54 Transl. into ENGLISH from Computerwoche (Munich), 27 Jan. 1984 p 25 (For primary document see N85-25647 15-31)
Avail: NTIS HC A04/MF A01

The use of CAD/CAM systems are outlined. Programs amendable to support manufacturing technology program (CAD/CAM) are divided in two phases. The first phase includes system analyses, training of workers, alternatives and feasibility studies and preparation of specification and performance catalogues. In the second phase the procurement of hardware and software, and third party develoment are studied. The CAM system is a dialogue oriented data processing system with the possibility of interactive processing of material in several functional domains such as production planning, materials control, and time control and contract schedule control. The CAD system is a dialogue oriented data processing system, with the possibility of graphical interactive processing in the functional domains of planning, development, and design. E.A.K.

N85-25652# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
1 May 1985 139 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-013) Avail: NTIS HC A07/MF A01

Information pertaining to national developments, applied sciences, life sciences, environmental quality, communications, computer science, lasers, medical radiology, radiation protection, and semiconductors are presented. For individual titles, see N85-25653 through N85-25657.

N85-25653# Joint Publications Research Service, Arlington, Va.
A SURVEY OF RADAR ECM AND ECCM **c32**
Li Nengjing and Zhang Yiting *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-013) 1 May 1985 p 27-34 refs Transl. into ENGLISH from Dianzi Xuebao (Beijing), v. 13, no. 1, Jan. 1985 p 99-109 (For primary document see N85-25652 15-31)
Avail: NTIS HC A07/MF A01

Power is the basic index of jamming, and the major ways to its improvement are: (1) to further raise the power of its single tube. Currently, the continuous wave power of the single traveling wave tube has already reached several kW, and a tube with power in the range of 10 kW is being developed, (2) utilizing the multi-beam jamming techniques of directional and beam power management. The ALQ-161 self-protective jamming system on the B-1 bomber is already using this type of technique. It is estimated that it will

develop even further in the near future, (3) utilizing microwave solid state efficiency amplifier in the development towards solid state array jamming system. It is estimated that this type of amplifier would reach the level of one hundred watts in the 20 GHz frequency range, around 1985. G.L.C.

N85-25654# Joint Publications Research Service, Arlington, Va.
MICROCOMPUTER CONTROLLED IMAGE ACQUISITION SYSTEM **c61**
Xiong Xiuxhong and Dai Shengwei *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-013) 1 May 1985 p 45-48 refs Transl. into ENGLISH from Weijisuanji Yingyong (Beijing), v. 5, no. 1, Feb. 1985 p 53-55 (For primary document see N85-25652 15-31)
Avail: NTIS HC A07/MF A01

The TRS-80 microcomputer controlled image digitizing acquisition device system was developed. Any acquisition area can be set up (the maximum image is 256x256 dots), it has 256 grades of grey, an average acquisition speed of 40 microseconds per dot, thus the acquisition time for each image can generally be determined by multiplying the total number of dots in the image by the dot acquisition time. In the acquisition process, the focus can be monitored using an ordinary oscilloscope, and images which have been stored can be displayed on the oscilloscope. Average display time for each dot is 8 microseconds because the system uses a TRS-80 microcomputer which has a primary frequency of less than 1.8 MHz. G.L.C.

N85-25655# Joint Publications Research Service, Arlington, Va.
MICROCOMPUTER CONTROLLED AUTOMATIC PEAK LOCKING OF LASER CIRCUIT **c36**
Yu Daoheng and Xie Boqing *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-013) 1 May 1985 p 49-53 Transl. into ENGLISH from Weijisuanji Yingyong (Beijing), v. 5, no. 1, Feb. 1985 p 56-58 (For primary document see N85-25652 15-31)
Avail: NTIS HC A07/MF A01

When an iodine stable He-Ne laser is working, the laser beam must be correctly locked onto one of ten spectral lines. This is currently done manually and it is very inconvenient. A method using a TP801 single board computer controlled laser frequency stabilizer for automatic peak locking and an outline of the computer logic is reviewed. This method can be used for automatic peak locking of other multiple spectral lines. G.L.C.

N85-25656# Joint Publications Research Service, Arlington, Va.
APPLICATION OF PERTURBATION THEORY TO PROBLEM IN ORBITAL THEORY **c13**
Zhou Huanwen *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-013) 1 May 1985 p 54-59 refs Transl. into ENGLISH from Shuxue Wuli Xuebao (Wuhan), no. 1, 20 Mar. 1984 p 39-43 (For primary document see N85-25652 15-31)
Avail: NTIS HC A07/MF A01

Difficulties associated with critical values frequently arise in calculations of perturbations of earth satellite orbits (the critical values are e=o, 1=0 and 4-5 sin squared 1=0. The anomalous behavior at the critical points is not intrinsic to the physics but is an artifact of the computational methods. These difficulties are surmounted through the use of perturbation series expansions. For both critical and noncritical problems the secular terms can be eliminated and a periodic solution obtained. Author

N85-25657# Joint Publications Research Service, Arlington, Va.
SPACE BRAIN RESEARCH IN CHINA REPORTED **c52**
Mei Lei *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-013) 1 May 1985 p 83-90 refs Transl. into ENGLISH from Kongjian Kexue Xuebao (Beijing), v. 4, no. 4, Oct. 1984 p 326-329 (For primary document see N85-25652 15-31)
Avail: NTIS HC A07/MF A01

Following the progress of the manned spaceflights, a lot of work had been done in other countries to study space travel related disorders in the vestibular system. At the same time, a series of simulated, ground-based experiments to study, from a broader angle of view, the techniques, methods and theories involved in space brain science research was conducted. The important conclusions arrived at from experimental results are briefly summarized. G.L.C.

N85-25658# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
10 May 1985 106 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-85-018) Avail: NTIS HC A06/MF A01

Various articles in science and technology are presented in this East Europe report. Subject matter covered includes: (1) computer aided manufacturing and design for electronic components; (2) welding technology; (3) process control systems; (4) modular robots; and (5) industrial metrology. For individual titles, see N85-25659 through N85-25666.

N85-25659# Joint Publications Research Service, Arlington, Va.
PROCESS CONTROL SYSTEMS FOR LARGELY AUTOMATED MANUFACTURING **c37**
W. Fritzsch, D. Kochan, J. Schaller, and H. J. Zander *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 14-32 refs Transl. into ENGLISH from Messen Steuern Regeln (East Berlin), v. 27, no. 10, 1984 p 434-439 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

An analysis of control structures needed in the design of a flexible, largely automated manufacturing process is presented. An overview of ways in which control processes can be modeled is described. An attempt is made to clearly define terms, some of which are interpreted differently in various technical disciplines, thus laying the groundwork for interdisciplinary cooperation. B.W.

N85-25660# Joint Publications Research Service, Arlington, Va.
CaD SYSTEMS FOR ELECTRONIC COMPONENT DESIGN REVIEWED **c33**
Siegfried Pilz *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 33-53 refs Transl. into ENGLISH from Messen Steuern Regeln (East Berlin), v. 27, no. 10, 1984 p 439-446 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

The need for computer aided systems for electronic component design is reviewed. The item to be designed determines the process technology to be used, i.e., the design methods and technology. These methods and technology determine the requirements to be met by the software technology, which in turn is closely associated with the hardware technology, the quality of which together with the software technology determines to a great extent the quality of communication between the designer and the CAD system, and therefore the effectiveness of the design (interactive communication: menu and manipulation techniques). In accordance with the state of the art of highly integrated circuitry, an electronic device as an item to be designed must be viewed as a system whose major components are printed circuit boards and panels, as well as integrated circuits including the necessary software. Programming techniques, cost factors and ergonomic considerations are discussed. B.W.

N85-25661# Joint Publications Research Service, Arlington, Va.
APPLICATIONS, SPECIFICATIONS OF ROBOTRON CAD-CAM WORK STATIONS **c37**
Herbert Willem and Peter Kuntsche *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 54-66 refs Transl. into ENGLISH from Messen Steuern Regeln (East Berlin), v. 27, no. 10, 1984 p 446-449, 457 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

Technically and economically effective use of CAD/CAM systems requires simultaneous thorough preparation and introduction of such systems, which in turn includes conscientious planning and integration of further organizational processes and EDP measures to increase effectiveness, preparation of the required applications software as well as necessary training and continuing education and motivation of employees and management personnel. Characteristics of CAD/CAM systems which are necessary

for increased performance are discussed. Applications and specifications for the VEB Robotron Combine CAD/CAM work station are described. B.W.

N85-25662# Joint Publications Research Service, Arlington, Va.
SOVIET INSTITUTE DIRECTOR ON GDR-USSR WELDING TECHNOLOGY **c37**
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 67-69 Transl. into ENGLISH from Volksstimme (Madgeburg, East Germany), 29 Dec. 1984 p 4 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

Technological welding processing and welding devices developed at the Electric Welding Institute in the U.S.S.R. are discussed. The joint research effort with the Central Institute for Welding engineering in the GDR is also discussed. B.W.

N85-25663# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL ASPECT OF WELDING TECHNOLOGY RESEARCH DISCUSSED **c37**
Matthias Schlegel *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 70-72 Transl. into ENGLISH from Neue Zeit (East Berlin), 14 Jul. 1984 p 7 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

Joint activities involve establishing the computer aided mathematical principles for practical applications of welding technology are discussed. The use of mathematical methods to investigate welding processes in order to optimize welding techniques is described. B.W.

N85-25664# Joint Publications Research Service, Arlington, Va.
APPLICABILITY OF MODULAR VERSUS UNIVERSAL ROBOTS DISCUSSED **c37**
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 73-76 Transl. into ENGLISH from Wochenpost (East Berlin), no. 33, 17 Aug. 1984 p 17 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

More and more robot manufacturers around the world are making the transition to modular assembly with the modular system the user can assemble exactly the kind of robot needed or a particular application. This kind of tailoring is based solely on economic and production engineering requirements. The advantages and disadvantages of developing modular robots are discussed. Joint cooperation among social countries in this endeavor is also discussed. B.W.

N85-25665# Joint Publications Research Service, Arlington, Va.
NEW SENSOR FOR INDUSTRIAL METROLOGY DEVELOPED **c35**
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 77-81 Transl. into ENGLISH from Neuer Tag (Frankfurt-Oder, East Germany), 5 Jan. 1985 p 2 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

New developments in the field of industrial metrology are discussed. Rapid advancement in scientific fields is making processes and equipment of increasingly high precision necessary. As the speed of light and fixed reference point temperatures have been considered reliable constants of measurement standards. One method of harnessing such natural norms for technical use and thus for exceptionally high precision industrial metrological processes uses the wavelength of laser light as the basis for a new kind of sensor. This development makes it possible to input nonelectrical variables such as travel, force, mass and pressure directly to a computer. B.W.

N85-25666# Joint Publications Research Service, Arlington, Va.
NEW DESIGNS FROM ELECTRONICS R AND D CENTER **c33**
Wladyslaw Wielich *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 93-100 Transl. into ENGLISH from Pomiary Automatyka Kontrola (Warsaw), no. 12, Dec. 1984 p 375-377 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

Hybrid microelectronic circuits used in computer object interface devices are discussed. These circuits are based on the technology of thin silicon films and microassemblies of printed circuits. Development techniques are discussed. B.W.

N85-25334# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL MODEL FOR ROLLOUT OF PLANET ROVING VEHICLE FROM LANDING CRAFT Abstract Only
Y. I. Grigoryev and S. N. Yermakov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 96 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 543-556 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-26187# Liebenberg and Stander, Consulting Engineers, Cape Town (South Africa).
AN APPROACH FOR USER CONTROLLED REINFORCED CONCRETE DESIGN OPTIMIZATION
P. C. Olsen *In* South African Inst. of Civil Engineering Symp. on Computers in Civil Eng., 1983 1983 16 p refs (For primary document see N85-26182 15-61)
Avail: NTIS HC A10/MF A01

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N85-25667 British Broadcasting Corp., Kingswood (England). Engineering Div.
ELECTRONIC DETECTION AND CONCEALMENT OF FILM DIRT
R. Storey Feb. 1985 25 p refs
(BBC-RD-1985/4) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Film as an image source for television has four obvious impairments; film grain, dirt, unsteadiness and motion aliasing. The first three of these impairments can, at least in theory, be minimized electronically. A new method is described that can detect and conceal the image of dirt particles and printed dirt on both monochrome and color film. The methods of detection and concealment are described together with details of a preferred realization of the equipment. A description of the unsuccessful techniques examined during the course of this investigation is also included, for completeness. The prototype equipment has a single adjustable parameter which governs the maximum detectable size of dirt for a given visibility of motion impairment. The small dirt only mode may be safely used without previewing, when it will conceal the majority of dirt in typical 16 mm film with negligible motion impairment. The remaining large dirt can be concealed by adjusting the motion protection compromise manually, but source material should then be previewed, to check for motion of the type likely to cause noticeable motion impairment. B.W.

N85-25668 Communications Research Centre, Ottawa (Ontario). Radar and Communications Technology Branch.
THE DISTORTION OF AM BROADCAST ANTENNA PATTERNS AS CAUSED BY NEARBY TOWERS AND HIGHRISE BUILDINGS
G. M. Royer Mar. 1985 96 p refs
(CRC-1379) Copyright. Avail: Issuing Activity

The AM broadcast antennas are designed to have patterns which provide an adequate broadcasting service, while at the same time satisfying domestic and international regulations with respect to permissible levels of interference with signals from other stations operating in the same frequency band. The erection of a tower or highrise building near a broadcast antenna could distort the

antenna's pattern such that the above objectives are not met. The purpose of this report to: (1) provide the engineer with sufficient information to enable him to compute whether or not a given structure will cause serious pattern distortion; and (2) investigate methods for reducing the strength of a tower's scattered field; thereby reducing the tower's pattern distorting effects. E.A.K.

N85-25669 National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).
DEVELOPMENT OF THE MICROWAVE ANTENNA RANGE OF THE NATIONAL ANTENNA TEST FACILITY AT PAARDEFONTEIN
D. E. Baker 1983 10 p ref
(R-NIAS-21; FF-1) Copyright. Avail: Issuing Activity

The development of a ground reflection test range at Paardefontein is described. In addition to presenting some aspects of the range design and the measured performance, the physical development of the site will be highlighted. Author

N85-25670 National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).
MEASURED PERFORMANCE OF A BROADBAND MATCHING SECTION FOR PERIPHERALLY FED HELICAL ANTENNAS
D. E. Baker 1983 10 p refs
(R-NIAS-25; Q-1) Copyright. Avail: Issuing Activity

The measured performance of an impedance matching section incorporated into the first turn of a peripherally fed helical antenna to transform its impedance to 50 omega is described. The design of the matching section is briefly reviewed. The measured results show that very low VSWR (1,2:1) can be achieved over the usable frequency range of the antenna. In addition to showing the basic impedance matching performance, results are also presented to illustrate the effect of the number of helix turns and of the conductor diameter on the impedance match. Antenna pattern data show that improved performance can be achieved by a simple termination at the free end of the helix. B.W.

N85-25671 National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).
DESIGN AND SWEPT-FREQUENCY MEASUREMENT OF PRINTED CIRCUIT BOARD LOG-PERIODIC DIPOLE ARRAYS
D. A. McNamara and D. E. Baker 1983 10 p refs
(R-NIAS-23; L-1) Copyright. Avail: Issuing Activity

This paper describes the design and measured performance of printed circuit board (PCB) log-periodic dipole arrays (LPDA's) etched on dielectric substrates. The design method is described in terms of a simplified flow chart for an interactive computer program. Design techniques for conventional LPDA's are modified to take into account the presence of the dielectric layer between the dipole elements by using an effective relative permittivity. The output from the PCB LPDA computer program is used to generate a computer tape to drive an auto-coradograph which scribes a scaled up version of the required artwork onto rubilith. The computer program plus tape relieves the antenna designer from the chore of manual computations and artwork layout. Swept-frequency measurement techniques are used to examine the performance of two PCB LPDA's. B.W.

N85-25672 Massachusetts Univ., Amherst.
MEASUREMENT OF OCEAN SURFACE CURRENTS FROM SPACE WITH MULTI-FREQUENCY MICROWAVE RADARS Ph.D. Thesis
R. S. Raghavan 1984 100 p
Avail: Univ. Microfilms Order No. DA8500125

The concept of using microwave radars to map ocean surface currents is considered in this dissertation. The theory of surface current measurements using the dual frequency microwave technique is presented and the signal to noise ratio relevant to the problem is defined. Signal processing requirements of the dual frequency system that enable the extraction of stable current information from the cross product spectrum of the two backscattered microwave signals are examined. The quantities considered include the minimum observation time, the sampling rate, frequency stability requirements and the spectral stability. It is shown that systems that are likely candidates for surface current mapping must be located in geostationary orbit. Problems related to the spatial resolution of the currents are addressed and the concept of using multiple antennas to resolve the currents azimuthally is introduced. Dissert. Abstr.

N85-25673 British Aerospace Dynamics Group, Bristol (England). Guidance and Control Dept.
MULTI-BISTATIC RADAR FOR SHORT RANGE SURVEILLANCE
I. W. Larkin Jun. 1980 21 p refs
(BAe-BT-10603) Copyright. Avail: Issuing Activity

Bistatic and multibistatic radars were compared with monostatic radars for ground-based surveillance over a range of 15 to 25 km. Multibistatic radars have advantages in clutter rejection, passive receiver sites, reduction of interference in an area and the possibility of winking under threat. They have disadvantages in terms of increased complexity of signal processing. Certain modes of clutter rejection are not available to a ground-based system. Terrain obscuration may not prove any more of a problem to bistatic than to monostatic radar. Target location accuracy depends on accurate knowledge of the baselength and rangefinders may be required for this purpose, or atomic clocks with a resynchronizing link may be used, enabling pseudo-random frequency agile operation. Author (ESA)

N85-25674 British Aerospace Dynamics Group, Bristol (England). Human Factors Dept.
PRELIMINARY ASSESSMENT OF THE HEURISTICS H2000 SPEECHLINK - SPEECH RECOGNITION DEVICE
A. M. Irving, J. Laird Evans, and C. Hopkins Sep. 1981 55 p refs
(BAe-BT-12276) Copyright. Avail: Issuing Activity

The Heuristics H2000 Speechlink speaker-dependent, isolated word, speech recognition device was tested using a list of words ranging from easy to very difficult to recognize. The results fail to substantiate the manufacturer's claims for a recognition level of 85% to 100%. It is concluded that this recognition device is not appropriate for military application, although it can be of use in examining further aspects of direct voice input. Author (ESA)

N85-25675 British Aerospace Dynamics Group, Bristol (England). Human Factors Dept.
A PRELIMINARY INVESTIGATION INTO THE INTELLIGIBILITY OF MICROSPEECH-2, A SPEECH SYNTHESISER
A. M. Irving and R. W. Hogg Nov. 1981 57 p refs
(BAe-BT-12284) Copyright. Avail: Issuing Activity

The intelligibility of the Microspeech-2 speech synthesizer was assessed using an adapted form of the Modified Rhyme Test on four experimental groups. Familiarity with the system and prior knowledge of the 25 test words result in high intelligibility scores, while no prior knowledge of the system or test words result in considerably lower intelligibility scores. Of the two other groups, those with prior knowledge of the test words but no experience of the system find Microspeech more intelligible than those with limited experience but no prior knowledge of the test words. Author (ESA)

N85-25676 British Aerospace Dynamics Group, Bristol (England). Human Factors Dept.
A REVIEW OF SPEECH SYSTEMS
Ann M. Irving Nov. 1981 61 p refs
(BAe-BT-12285) Copyright. Avail: Issuing Activity

Techniques of producing direct voice input for computer controlled systems are discussed. Speech production methods; speech synthesis using waveform encoding, parameter encoding, and phoneme synthesis are reviewed. Analog recorded messages are mentioned. Author (ESA)

N85-25677 British Aerospace Dynamics Group, Bristol (England). Human Factors Dept.
AN INTRODUCTORY STUDY OF AUTOMATIC SPEECH RE-

COGNITION SYSTEMS
Ann M. Irving Nov. 1981 104 p ref
(BAe-BT-12286) Copyright. Avail: Issuing Activity

Speech recognition techniques; human factors problems of man machine interaction; and applications of speech recognition devices are discussed. Isolated automatic speech recognition; connected automatic speech recognition; and continuous automatic speech recognition techniques are reviewed. Author (ESA)

N85-25678*# Hydraulic Research Textron, Irvine, Calif. Systems Engineering Div.
COMPENSATOR DEVELOPMENT AND EXAMINATION OF PERFORMANCE AND ROBUSTNESS Final Report
6 Mar. 1985 40 p refs Prepared for JPL
(Contract JPL-956541)
(NASA-CR-175703; JPL-9950-1023; NAS 1.26:175703) Avail: NTIS HC A03/MF A01 CSCL 20N

This research focuses on the development of compensators to control the mean square surface error of a wraprib antenna. The methodology is as follows: A model of appropriate size and structure is developed by looking at the convergence of functional gains for control and estimation. Then an LQG compensator is designed using this model. Finally, the compensator is simplified using balanced realization theory. In the conventional approach for compensator design, there is no mechanism for ensuring that the model is adequate for designing a compensator which will achieve the desired level of performance. It is shown here that both the model order and compensator order are directly related to the closed loop performance requirements for the system. B.W.

N85-25679*# Cubic Corp., San Diego, Calif.
MOBILE ANTENNA AND BEAM POINTING STUDIES FOR SATELLITE MOBILE COMMUNICATIONS Final Report
6 Feb. 1985 69 p Prepared for JPL
(Contract JPL-956691)
(NASA-CR-175736; JPL-9950-1006; NAS 1.26:175736; TR/209-3) Avail: NTIS HC A04/MF A01 CSCL 17B

The cost and performance of the mechanically scanned 1 x 4 planar array and the conformal array were developed further. Costs and designs of several antenna pointing techniques are reported. A.R.H.

N85-25680*# Ball Aerospace Systems Div., Boulder, Colo.
CONCEPTS AND COST TRADE-OFFS FOR LAND VEHICLE ANTENNAS IN SATELLITE MOBILE COMMUNICATIONS Final Report
H. A. Haddad Jul. 1948 97 p Prepared for JPL
(Contract JPL-956686)
(NASA-CR-175731; JPL-9950-1008; NAS 1.26:175731; F84-10) Avail: NTIS HC A05/MF A01 CSCL 17B

Several antenna design concepts, operating at UHF (821 to 825 MHz transmit and 866 to 870 MHz receive bands), with gain ranging between 6 and 12 dBic, that are suitable for land mobile vehicles are presented. The antennas may be used within CONUS and ALASKA to communicate to and from a geosynchronous satellite. Depending on the type of steering mechanism, the antennas are broken down into three categories; (1) electronically scanned arrays with phase shifters, (2) electronically switched arrays with switchable power dividers/combiners, and (3) mechanically steered arrays. The operating characteristics of two of these design concepts, one a conformal antenna with electronic beam steering and the other a nonconformal design with mechanical steering, were evaluated with regard to two and three satellite system. Cost estimates of various antenna concepts were made and plotted against their overall gain performance. B.G.

N85-25681*# Cubic Corp., San Diego, Calif.
TRADE-OFF BETWEEN LAND VEHICLE ANTENNA COST AND GAIN FOR SATELLITE MOBILE COMMUNICATIONS Interim Report
20 Aug. 1984 185 p Prepared for JPL
(Contract JPL-956691)
(NASA-CR-175732; JPL-9950-1009; NAS 1.26:175732; TR/209-1) Avail: NTIS HC A09/MF A01 CSCL 17B

Trade-offs between antenna cost and gain made for nine antennas as a feasibility study for the experimental land mobile satellite system, M-SAT(X) reported. This system is under development by JPL-NASA for a mobile telephone system to be used throughout the continental USA and Alaska. The mobile antenna is a key element in the development of this system. E.A.K.

N85-25682*# Ball Aerospace Systems Div., Boulder, Colo.
LAND VEHICLE ANTENNAS FOR SATELLITE MOBILE COMMUNICATIONS Final Report
H. A. Haddad, B. V. Pieper, and D. B. McKenna Feb. 1985 121 p Prepared for JPL
(Contract JPL-956686)
(NASA-CR-175735; JPL-9950-1024; NAS 1.26:175735; F85-02) Avail: NTIS HC A06/MF A01 CSCL 17B

The RF performance, size, pointing system, and cost were investigated concepts are: for a mechanically steered 1 x 4 tilted microstrip array, a mechanically steered fixed-beam conformal array, and an electronically steered conformal phased array. Emphasis is on the RF performance of the tilted 1 x 4 antenna array and methods for pointing the various antennas studied to a geosynchronous satellite. An updated version of satellite isolations in a two-satellite system is presented. Cost estimates for the antennas in quantities of 10,000 and 100,000 unites are summarized. A.R.H.

N85-25683*# Texas Univ., Austin. Electrical Engineering Research Lab.
MEASUREMENT RESULTS FROM A BALLOON EXPERIMENT SIMULATING LAND MOBILE SATELLITE TRANSMISSIONS
Wolfhard J. Vogel and Geoffrey W. Torrence Apr. 1984 57 p refs Prepared for JPL
(Contract JPL-956520)
(NASA-CR-175740; JPL-9950-1049; NAS 1.26:175740) Avail: NTIS HC A04/MF A01 CSCL 17B

A transmitter operating at 869.525 MHz was twice carried by a stratospheric balloon to an altitude of about 40 km. A motor vehicle was driven within the line-of-sight from the transmitter. Measurements of the received signal strength were made every 1/8 wavelength for an overall travelling distance of about seven hundred kilometers. This scenario was to simulate a satellite system providing mobile communications to rural areas. The statistics of the sampled field, consisting of a combination of direct wave, specular reflection and diffuse components, are presented as a function of elevation angle. Parameters such as type of road driven (mostly 2 lane) or type of landscape (rolling to flat) and vegetation (pine and mixed forest) encountered are described where possible. The power distribution function for all the data, at elevation angles from 10 to 35 degrees, is 1 dB below the free space mean at the 50% level, 7 dB below at the 90% level, and 18 dB below at the 99% level. In the elevation angle range of 30 to 35 degrees the corresponding values were found to be .5, 1.2, and 4.5 dB. The conditional fade duration and level crossing rate distribution functions are also presented. The former shows some dependence on the threshold level, the latter almost none. Author

N85-25684*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROPAGATION CONSIDERATIONS IN LAND MOBILE SATELLITE TRANSMISSION
Wolfhard J. Vogel (Texas Univ., Austin) and Ernest K. Smith 24 Jan. 1985 26 p refs
(NASA-CR-175733; JPL-9950-1050; NAS 1.26:175733; MSAT-X-105) Avail: NTIS HC A03/MF A01 CSCL 17B

It appears likely that the Land Mobile Satellite Services (LMSS) will be authorized by the FCC for operation in the 800 to 900 MHz (UHF) and possibly near 1500 MHz (L-band). Propagation problems are clearly an important factor in the effectiveness of this service, but useful measurements are few, and produced contradictory interpretations. A first order overview of existing measurements is presented with particular attention to the first two NASA balloon to mobile vehicle propagation experiments.

Some physical insight into the interpretation of propagation effects in LMSS transmissions is provided. Author

N85-25685*# Texas Univ., Austin. Electrical Engineering Research Lab.
LAND MOBILE SATELLITE TRANSMISSION MEASUREMENTS AT 869 MHz: SELECTED RESULTS FROM THE DEDICATED STRATOSPHERIC BALLOON EXPERIMENT OF NOVEMBER 12 AND 13, 1984
Wolfhard J. Vogel 12 Apr. 1985 47 p refs Prepared for JPL (Contract JPL-956520)
(NASA-CR-175734; JPL-9950-1053; NAS 1.26:175734) Avail: NTIS HC A03/MF A01 CSCL 17B

Satellite transmissions were simulated by placing an 869 MHz and a 1501 MHz transmitter aboard a stratospheric balloon. The balloon was followed on the ground by a van equipped with receivers and data acquisition equipment capable of creating a permanent record of the variations of the received signal amplitude and phase at the two signal frequencies. Results from simulated satellite transmission measurements at 869 MHz are presented. The data show that attenuation by roadside trees can be a limiting factor in systems with a 5 dB fade margin, if 84% availability is not acceptable. In less extreme environments, fading is much less severe. Without fading present, the signal power density function often could be described as Ricean with direct to scattered ratio power ratios of about 100. Phase fluctuations were apparent whenever the signal amplitude fluctuated. The duration of the fades and nonfades tended to cluster close to one wavelength. The power spectrum of both the amplitude and the phase show that most of the fluctuations occur at frequencies below the Doppler shift. A.R.H.

N85-25686*# Ohio State Univ., Columbus. ElectroScience Lab.
ANALYSIS OF THE ELECTROMAGNETIC SCATTERING FROM AN INLET GEOMETRY WITH LOSSY WALLS Progress Report
N. H. Myung, P. H. Pathak, and C. D. Chunang Apr. 1985 91 p refs
(Grant NAG3-476)
(NASA-CR-175743; NAS 1.26:175743; PR-715723) Avail: NTIS HC A05/MF A01 CSCL 20N

One of the primary goals is to develop an approximate but sufficiently accurate analysis for the problem of electromagnetic (EM) plane wave scattering by an open ended, perfectly-conducting, semi-infinite hollow circular waveguide (or duct) with a thin, uniform layer of lossy or absorbing material on its inner wall, and with a simple termination inside. The less difficult but useful problem of the EM scattering by a two-dimensional (2-D), semi-infinite parallel plate waveguide with an impedance boundary condition on the inner walls was chosen initially for analysis. The impedance boundary condition in this problem serves to model a thin layer of lossy dielectric/ferrite coating on the otherwise perfectly-conducting interior waveguide walls. An approximate but efficient and accurate ray solution was obtained recently. That solution is presently being extended to the case of a moderately thick dielectric/ferrite coating on the walls so as to be valid for situations where the impedance boundary condition may not remain sufficiently accurate. R.J.F.

N85-25687# Lincoln Lab., Mass. Inst. of Tech., Lexington. Group 61.
ELECTROMAGNETIC SCATTERING BY ARBITRARILY SHAPED REFLECTORS: SUBREFLECTOR EFFICIENCY
Andre Dion and Letitia V. Moresan 31 Oct. 1984 39 p refs
(Contract F19628-85-C-0002; AF Proj. 2029; AF Proj. 6430)
(AD-A149224; ESD-TR-84-050; TR-662) Avail: NTIS HC A03/MF A01 CSCL 20/14

A general expression for the electromagnetic scattering by an arbitrary shaped reflector is developed and applied in a computer model of offset hyperboloid reflectors. The computed scattering is shown to be in excellent agreement with scattering measurements made on an offset reflector of projected diameter = 24 cm, at frequencies of 10.35 GHz, 20.7 GHz and 44.5 GHz. Next, using the computer model, the efficiency of the subreflector in a dual-reflector antenna is calculated as a function of subreflector diameter and for two values of illumination taper. For subreflectors truncated at the ray-optics boundary the calculated efficiency is 0.83 and 0.91, respectively, for truncation diameter of 7.7 lambda and 30.4 lambda, with 5 dB of illumination taper; these respective efficiencies increase to 0.91 and 0.95 with 12 dB of illumination taper. However, subreflectors of diameter about two wavelengths larger than the ray-optics diameter have very nearly unit efficiency. Author

N85-25688# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
PLURIBUS SATELLITE IMP (INTERFACE MESSAGE PROVISION) DEVELOPMENT MOBILE ACCESS TERMINAL NETWORK Quarterly Technical Report, 1 May - 31 Jul. 1984
Aug. 1984 23 p
(Contracts MDA903-80-C-0353; N00039-81-C-0408)
(AD-A151201; BBN-5797; CQTR-34) Avail: NTIS HC A02/MF A01 CSCL 17/2

This quarterly technical report describes work on the development of Pluribus Satellite IMPs: and on shipboard satellite communications. Packets; Packet broadcast; Satellite communication; Gateways; Pluribus Satellite IMP, Shipboard communications; ARPANET; and Internet are described. GRA

N85-25689# Pennsylvania State Univ., University Park. Applied Research Lab.
RECEIVER OPTIMIZATION FOR DETECTION IN DOUBLY SPREAD COMMUNICATION CHANNELS
D. M. Drumheller 10 Dec. 1984 117 p
(Contract N00024-79-C-6043)
(AD-A151226; ARL/PSU/TM-84-185) Avail: NTIS HC A06/MF A01 CSCL 17/2

The problem addressed in this thesis is the maximization of the expected matched filter receiver response to a signal that has been transmitted through a communication channel whose average scattering properties are known in terms of a scattering function. This is accomplished by altering the receiver processing signal given the channel scattering function and transmit signal. The channel is assumed to be doubly-spread, meaning that any signal propagated through it will exhibit both time and frequency spreading. The scattering functions that describe these channels subtend a finite region in the delay-Doppler plane. This thesis contains some of the background material necessary to understand the modeling of communication channels as random linear time-varying systems and the use of matched filter receivers for signal detection. This material includes a review of the properties of linear spaces, Fourier transforms, and the foundational material leading to the development of the scattering function. GRA

N85-25690# Pennsylvania Univ., Philadelphia. School of Electrical Engineering.
STATISTICAL TECHNIQUES FOR SIGNAL PROCESSING Annual Technical Report, 1 Nov. 1983 - 31 Oct. 1984
S. A. Kassam 10 Dec. 1984 5 p
(Grant AF-AFOSR-0022-82)
(AD-A151231; AFOSR-85-0197TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The area of nonlinear edge-preserving robust smoothing was one area of focus for our research. In this area a dissertation was completed. We have been able to give deterministic and statistical characterizations of the performance of some useful types of nonlinear filters which may be thought of as arising from the classical robust estimates of location (Land M- estimates), and we have demonstrated their applicability in image processing. We are continuing to obtain new results in this area in our current work. In the area of nonparametric detection the case of narrowband signals in noise has been studied. We have established the natural counterparts of the sign-detection schemes for this class of signals. This material is currently being prepared for publication in a technical journal. A paper on quantization of data in narrowband signal detection was also published during the last grant year. On the subject of optimum quantization of data for

signal detection (hypothesis testing) a comprehensive exposition has been written for publication as a chapter in a book to be published next year. These results on statistical optimization of quantization in detection systems are of considerable interest for digital implementations. Currently being revised for publication also is a paper on optimum quantization in matched filtering and smoothing of data. Finally, a paper on multi-input robust Wiener smoothing was also published during the last grant year. GRA

N85-25691# Pennsylvania Univ., Philadelphia. Dept. of Electrical Engineering and Science.
NONPARAMETRIC DETECTION OF NARROWBAND SIGNALS
S. A. Kassam Jun. 1984 5 p Presented at the 27th Midwest Symp., Circuits and Systems, Jun. 1984
(Grant AF-AFOSR-0022-82)
(AD-A151280; AFOSR-85-0192TR) Avail: NTIS HC A02/MF A01 CSCL 20/3

For nonparametric detection of narrowband signals in narrowband noise the zero medians assumption of the low-pass known-signal detection problem becomes the zero marginal medians assumption on the in-phase and quadrature noise components. Detectors based on conditional counterparts of the low-pass sign correlator detector. In addition, the symmetry assumption on the noise probability densities in the univariate case becomes a diagonal symmetry assumption, for which conditional multilevel nonparametric detectors are defined. Author (GRA)

N85-25692# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
PLURIBUS SATELLITE IMP (INTERFACE MESSAGE PROVISION) DEVELOPMENT MOBILE ACCESS TERMINAL NETWORK Quarterly Technical Report, 1 Aug. - 31 Oct. 1984
Nov. 1984 37 p
(Contracts MDA903-80-C-0353; N00039-81-C-0408)
(AD-A151312; BBN-5883; QTR-35) Avail: NTIS HC A03/MF A01 CSCL 17/2

This quarterly technical report describes work on the development of Pluribus Satellite IMPs, and on shipboard satellite communications. GRA

N85-25693# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
INTERMEDIATE RESULTS OF THE NORDSEE EXPERIMENT
R. K. Moore, V. Hesany, R. Lawner, and S. Gogineni Nov. 1984 44 p
(Contract N00014-76-C-1105)
(AD-A151363; CRINC/RSL-TR-419-3) Avail: NTIS HC A03/MF A01 CSCL 17/9

The purpose of this report is to summarize the data collected during January 1984 from the Nordsee Tower in Germany. Brief descriptions of the system used and the experiment are given in section 2.0. Angular responses of the scattering coefficient are discussed in Section 3.0. The apparent ripple spectra calculated from backscatter measurements are presented in section 4.0, and the modulation transfer functions (MTFs) calculated from this data set are given in Section 5.0. Section 6.0 presents some general conclusions. A modified version of the University of Kansas helicopter-borne spectrometer (HELOSCAT) was used to acquire backscatter data during this experiment. Internal (relative) calibration of the system was accomplished by measuring the signal from a delay line switched in place of the antenna before and after each data run. External (absolute) calibration was performed by measuring the power received from a target of known radar cross-section a metal sphere with a diameter of 20 cm). Normally a Luneberg lens (which has a much higher cross-section than the metal sphere) is used for external calibration, but it was not possible to use the Luneberg lens during this experiment because of logistics problems. The main emphasis of these measurements was on long data sets at a few fixed azimuth angles (generally upwind, downwind or crosswind) and incidence angles with VV-polarization at 5.3, 10 and 15 GHz. During aircraft overflights, measurements were made at 5.3 GHz at a fixed azimuth angle and the same incidence angle used by the systems in the aircraft. GRA

N85-25694# Electronics Research Lab., Adelaide (Australia).
SKYWAVE RADAR DETECTABILITY OF VOLCANIC AERSOLS
S. J. Anderson Aug. 1984 40 p
(AD-A151448; ERL-0301-TR) Avail: NTIS HC A03/MF A01 CSCL 17/9

During 1982 there occurred several incidents in which commercial jet aircraft suffered engine failure over Indonesia as they passed through clouds of dust injected into the stratosphere by an erupting volcano on Java. This paper presents some theoretical estimates of the detectability of such clouds using over-the-horizon skywave radar. The results imply that detection would not be possible with the JINDALEE Stage B radar. GRA

N85-25695# Department of the Air Force, Washington, D.C.
INTERACTIVE COMMUNICATION CHANNEL Patent Application
R. H. G. Chan, inventor (to Air Force) Filed 27 Dec. 1984 69 p
(AD-D011580; US-Patent-Appl-SN-686954) Avail: NTIS HC A04/MF A01 CSCL 17/2

An interactive communication channel (ICC) provides a digital computer with high performance multi-channel interfaces. Sixteen full duplex channels can be serviced in the ICC with sequence or scan pattern being programmed and dependent upon the channels and their speed. A channel buffer system is used for line interface, and character exchange. The channel buffer system is on a byte basis. The ICC performs frame start and frame end functions, bit stripping and bit stuffing. Data is stored in a memory in block format (256 bytes maximum) by a program control and the ICC maintains byte address information and a block byte count. Data exchange with the memory is made by cycle steals. Error detection is also provided for using a cyclic redundancy check technique. GRA

N85-25696# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
HIGH FREQUENCY ESTIMATION OF 2-DIMENSIONAL CAVITY SCATTERING M.S. Thesis
R. S. Dering Dec. 1984 50 p
(AD-A151697; AFIT/GE/ENG/84D-24) Avail: NTIS HC A03/MF A01 CSCL 17/9

This thesis develops a simple ray tracing approximation for the high frequency scattering from a two-dimensional cavity. Whereas many other cavity scattering algorithms are very time consuming, this method is very swift. The analytical development of the ray tracing approach is performed in great detail, and it is shown how the radar cross section (RCS) depends on the cavity's length and width along with the radar wave's angle of incidence. This explains why the cavity's RCS oscillates as a function of incident angle. The RCS of a two dimensional cavity was measured experimentally, and these results were compared to computer calculations based on the high frequency ray tracing theory. The comparison was favorable in the sense that angular RCS minima and maxima were exactly predicted even though accuracy of the RCS magnitude decreased for incident angles far off-axis. Overall, once this method is extended to three dimensions, the technique shows promise as a fast first approximation of high frequency cavity scattering. GRA

N85-25697# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
WIDEBAND FIBER OPTIC COMMUNICATIONS LINK M.S. Thesis
J. R. Bray Dec. 1984 107 p
(AD-A151704; AFIT/GE/ENG/84D-16) Avail: NTIS HC A06/MF A01 CSCL 17/2

This thesis examined the feasibility of upgrading a nine port fiber optic bundle telecommunications system to a single strand fiber optic system. Usable pieces of equipment were identified and new Light Emitting Diodes (LED), Photodetectors and single strand SMA styled fiber optic connectors were ordered. Background research was conducted in the area of fiber optic power launching, fiber losses, connector losses and efficiencies. A new modulation/demodulation circuit was designed and constructed using parts

from unused equipment. A new front panel was constructed to house the components, switches and connectors. A 2-m piece of optical fiber was terminated with the new connectors and tested for connector loss, numeric aperture and attenuation. The new LED was characterized by its emission radiation pattern and the entire system was tested for functional operation, frequency response and bandwidth of operation. An operations manual was prepared to ensure proper use in the future. The result was a two piece, single strand, fiber optic communications systems fully TTL compatible, capable of transmitting digital signals from 80 Kbit/sec to 20 Mbit/sec. The system was tested in a half duplex mode using both baseband and carrier modulated signals. GRA

N85-25698# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

ANALYTICAL TECHNIQUES USED TO CALCULATE THE FIELDS DUE TO REFRACTION AND DIFFRACTION OF ELECTROMAGNETIC WAVES M.S. Thesis

J. L. Gribble Dec. 1984 97 p

(AD-A151705; AFIT/GEP/ENP/84D-4) Avail: NTIS HC A05/MF A01 CSCL 20/14

This thesis provides a compendium of analytical techniques which can be used to calculate the fields that are created when an electromagnetic wave is incident upon a physical object. Quasi-optical techniques (Geometrical Theory of Diffraction and Uniform Theory of Diffraction) are analyzed along with the more classical physical and geometrical optics techniques (Kirchoff Diffraction Theorem, Sommerfeld Diffraction Theorem, Fourier optics, and geometrical optics). The approximations that are used in each technique along with the regions of the electromagnetic spectrum where each technique can be applied are emphasized. Each technique is derived and all are shown to be ultimately dependent upon the validity of Maxwell's equations. The Fourier optics and Geometric Theory of Diffraction techniques are shown to be direct mathematical extensions of the Sommerfeld Diffraction Theorem. Each technique is then applied to a simple example problem. The technique of Fourier optics is shown to be very powerful while remaining mathematically simple. The Fresnel and Fraunhoffer approximations are most readily understood when this technique is used. It is also shown that the Geometric Theory of Diffraction and Uniform Theory of Diffraction are capable of giving accurate results when the physical object has a complex geometry. GRA

N85-25699# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

MARGIN LEVELING ALGORITHM FOR FULLY SATURATED SATELLITE TRANSPONDER WITH CDMA (CODE DIVISION MULTIPLE ACCESS) SIGNALLING M.S. Thesis

E. J. Putt Dec. 1984 100 p

(AD-A151710; AD-E950661; AFIT/GE/ENG/84D-52) Avail: NTIS HC A05/MF A01 CSCL 17/2

For satellite communications in a noninterfering environment, a specific downlink carrier-to-noise ratio (CNR) is needed to achieve a desired bit error rate. In an interfering environment, and additional CNR or margin is needed to overcome interfering effects. A situation may arise where the desired margins cannot be achieved due to limited uplink and satellite transmit power. If this is the case, margin leveling should occur in order to decrease the desired margins in a specific manner until all margins are achieved. The goal of this thesis is to develop a margin leveling algorithm under specific constraints. The satellite under study is assumed to be operating with the traveling wave tube amplifier in full saturation. The signalling scheme used is direct sequence code division multiple access (CDMA) communications. Two methods of margin leveling are created--the first being the margin leveling of only the links in which the desired margins are not achieved; the second being the margin leveling of all links whether the desired margins are achieved or not. In the latter case, all links are leveled by an equal amount. It is found that the computer time needed to perform margin leveling increases proportionally to the square of the number of links accessing the satellite. GRA

N85-25700# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

THE EFFECTS OF ATMOSPHERIC TURBULENCE ON AN AIR-TO-AIR OPTICAL COMMUNICATION LINK M.S. Thesis

J. N. Kanavos Dec. 1984 109 p

(AD-A151840; AFIT/GE/ENG/84D-38) Avail: NTIS HC A06/MF A01 CSCL 17/2

This thesis presents an analysis of the performance of an air-to-air optical communication link in the presence of atmospheric turbulence. As aircraft travel through the atmosphere, they encounter regions of atmospheric turbulence. While harmless to radio frequency communications, these regions of turbulence can cause both intensity and phase fluctuations within an optical beam, as a result, the communication link bit error rate rises. To evaluate the performance of such a link, a computer simulation was developed. By varying such parameters as the speed of the aircraft, its altitude, and propagation path length, a determination could be made about link performance. The results obtained from the simulation showed that atmospheric turbulence plays a significant role in determining link performance. GRA

N85-25701# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

SONARS WITH HIGH NOISE AND CLUTTER REJECTION FOR USE WITH ADAPTIVE ROBOTS Ph.D. Thesis

M. F. Guyote 1984 212 p

(AD-A151875; AFIT/CI/NR-85-29T) Avail: NTIS HC A10/MF A01 CSCL 06/4

The goal of this thesis is to develop an ultrasonic ranging system capable of providing range and azimuth information on targets buried in noise and clutter. The information is to be usable by adaptive robots. The two methods selected for research are frequency-modulated, continuous wave (FMCW) ranging, and pseudo-random binary sequence(PRBS) ranging. An experimental FMCW tracking system is designed, tested, and found able to provide useful tracking information under adverse noise conditions. The research is then directed towards PRBS correlation systems, which offer theoretically unlimited noise reduction. However, the basic correlation function is not ideal for control purposes. Two methods are developed which produce modified correlation functions more suitable for control. These methods, phase and time-shift modulation, are also used to move the transmitted spectrum to an area more usable by the transducers. The first experimental PRBS ranging system proves incapable of providing the desired cross-correlation function due to transducer bandwidth limitations and the link between bandwidth and frequency of operation. The second experimental PRBS ranging system uses double like sideband modulation and asynchronous demodulation. It cross-correlates the received signal with two time-shift modulated reference signals, and is capable of producing the desired correlator output and passing high-noise tests. The PRBS system is further modified to include target range and azimuth tracking capabilities. The system proves capable of tracking selected targets under conditions of high noise and clutter. GRA

N85-25702# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

THE PERFORMANCE OF A NEW ADAPTIVE FILTER FOR DIGITAL COMMUNICATIONS M.S. Thesis

J. R. Way, Jr. Jun. 1984 130 p

(AD-A151890; AFIT/GE/EE/84S-12) Avail: NTIS HC A07/MF A01 CSCL 17/2

The improvement in performance of a digital communications receiver preceded by an adaptive filter using the soft-constraint Least Mean Square algorithm is found. This algorithm has previously only been used in conjunction with adaptive antenna arrays. The fundamentals of adaptive filters and the spread spectrum technique are presented. A computer model is developed which simulated a 19 tap adaptive filter and spread spectrum receiver combination in the baseband region. The filter is shown to adapt well to hopping jammers and dual jammers. Plots of the filter's transfer function show notch depths ranging from -34 dB to -77 dB over iterations ranging from 15 to 5000 for the case of a 20 dB sinusoid jammer. The improvement gained by adjusting

the softness of the constraints is presented. The computer program and recommendation for further study are included as well as a 44 item bibliography. GRA

N85-25703# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
NULL GENERATION USING DISCS ON A REFLECTOR M.S. Thesis
M. D. Rudisill Dec. 1984 96 p
(AD-A151897; AFIT/GE/ENG/84D-55) Avail: NTIS HC A05/MF A01 CSCL 09/5

It has been shown possible experimentally to produce nulls in the pattern of a prime focus reflector antenna using discs mounted on the dish. A model of this antenna system is developed to evaluate optimal configurations and ideal performance. Aperture integration is the method of analysis used. Discs' effects are modeled as a phase shift on the aperture. No secondary effects, such as diffraction, are considered. Based on the model developed, guidelines are presented for antenna design. A computer code was written to implement the model and a prediction of antenna the system's performance is presented. Author (GRA)

N85-25704# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PROCESSING SPEECH FOR ANALYSIS USING OPTICAL FOURIER TECHNIQUES M.S. Thesis
D. L. Jones Dec. 1984 109 p
(AD-A151898; AFIT/GE/ENG/84D-37) Avail: NTIS HC A06/MF A01 CSCL 09/3

In this thesis a system for displaying speech as a two dimensional video image is presented. The speech is pre-processed by compressing its dynamic range and filtering to emphasize frequencies above 500 Hz. Blanking and sync pulses are inserted to put the signal in standard video format, and every other field is blanked to prevent interference between fields in the interlaced display. Two dimensional variation is achieved by modulating the baseband audio signal up in the spectrum near a multiple of the video scan rate. The relationship between input frequency and pattern angle of the display is derived, and it is shown that the set of frequencies near a multiple of the video scan rate have points in the spatial frequency domain which lie in a straight line at a distance from the origin proportional to the scan rate multiple. Two modulation frequencies are selected to display in the spatial frequencies domain the location of the first and second formant peaks. The two modulated signals are mixed with the baseband audio and displayed simultaneously in a single image. The images are digitized and an optical Fourier transform is simulated on the computer by creating the image which would appear in the Fourier transform plane. Entire words are processed by assembling individual frames on video tape. Author (GRA)

N85-25705# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ANALYSIS OF SPACE DIVERSITY TECHNIQUES FOR EHF (EXTREMELY HIGH FREQUENCY) SATELLITE DOWNLINKS M.S. Thesis
S. L. Skipper Dec. 1984 124 p
(AD-A151900; AFIT/GE/ENG/84D-61) Avail: NTIS HC A06/MF A01 CSCL 17/2

This study investigated some of the diversity combining techniques that can be used with a space diversity downlink reception configuration to overcome the attenuation effects of rainfall. The diversity combining techniques selected for development and analysis were selection, equal gain, and maximal ratio combining. Each of these techniques were considered with two different digital signalling schemes, 8-ary phase-shift keying (PSK) and differentially encoded quadrature PSK (DQPSK), to form six distinct diversity technique/signaling scheme combinations. The analysis was accomplished by deriving the probability of bit error functions for 8-ary PSK and DQPSK and by developing the probability of density functions for each diversity technique under the assumption of a slowly fading Rayleigh channel. By taking the integral from zero to infinity of the product of the two functions for each diversity technique/signaling scheme combination, the probability of bit error was calculate for each specified combination. GRA

N85-25706# Messina Univ. (Italy). Ist. di Struttura della Materia.
SCATTERING PROPERTIES OF A MOVING DIELECTRIC OBJECT Final Report, Nov. 1983 - Oct. 1984
R. Saija Dec. 1984 31 p
(Contract DAJA45-84-C-0005; DA Proj. IT1-61102-BH-57)
(AD-A151974) Avail: NTIS HC A03/MF A01 CSCL 20/6

This report deals with the scattering properties of a moving nonspherical object modellized as cluster of spheres. Two particular aspects of the problem are studied: (1) The effect of the changes of shape of the scatterers as a consequence of mutual collisions; and (2) The effect of a very high and very low refractive index on the scattering properties of a particle with possible onset of resonance scattering. Author (GRA)

N85-25707# Boeing Aerospace Co., Seattle, Wash.
PARTICLE SHAPE CHARACTERIZATION Final Report
C. D. Capps Oct. 1984 97 p
(Contract N00014-83-C-2151)
(AD-A151981) Avail: NTIS HC A05/MF A01 CSCL 20/6

In general, the particles comprising the earlier generation of obscurants were spherical. Nonspherical particles have, in some cases, been shown to possess more desirable properties, such as broader spectral effectiveness and more obscuration per unit mass. However, the theoretical problem of predicting the interaction of electromagnetic radiation with a particle of arbitrary size, shape, and index of refraction has not been solved for particles with a size on the order of the wavelength of the radiation. Thus, it is difficult to predict or interpret data from experiments conducted on nonspherical particles. The work reported herein addresses this problem with a phenomenological approach. An electrodynamic balance was built that stably suspends individual micron-sized particles. Individual spheres and nonspheres were suspended and photomicrographs were made of the particles while their scattering cross sections were measured in two orthogonal directions. The photographs and cross sections were then analyzed in a search for correlations between particle size and shape and the scattering cross section. This report is organized as follows. Section II contains a description of the experimental apparatus. Photographs of the particles, measurement methodology, and resulting size parameters are presented in Section III. Differential scattering cross-section plots are shown in Section IV and analysis and results described in Section V. Finally, results and conclusions are summarized in Section VI. GRA

N85-25708# Naval Postgraduate School, Monterey, Calif.
METEOROLOGICAL CONDITIONS AFFECTING ELECTROMAGNETIC PROPAGATION ON THE ARABIAN PENINSULA M.S. Thesis
W. F. Petersen Sep. 1984 136 p
(AD-A152019) Avail: NTIS HC A07/MF A01 CSCL 20/14

Modern U.S. Military radars and communication equipment performance will be strongly influenced by the environment it will be operating in. One of the most important atmospheric affects is ducting of electromagnetic energy by refractive layers in the atmosphere. To assess the affects of ducting on electromagnetic emissions around Dhahran, Saudi Arabia, a geometric optics model of wave propagation developed by Raymond P. Wasky was modified and utilized. This thesis also attempted to show the correlation of wind direction and wind speed to the establishment, location and heights of ducts. Finally this thesis attempted to determine if there was any correlation between the occurrence of land-sea breezes and ducting. GRA

N85-25709# Department of the Air Force, Washington, D.C.
ADCCP (ADVANCED DATA COMMUNICATION CONTROL PROCEDURE) COMMUNICATION PROCESSOR Patent Application
L. O. Kesler, inventor (to Air Force) Filed 6 Feb. 1985 13 p

(AD-D011595; US-Patent-Appl-SN-698725) Avail: NTIS HC A02/MF A01 CSCL 17/2

In this patent application, an ADCCP communication processor apparatus operates on-line between the PARCS data transmission controller (DTC) and the NORAD Cheyenne Mountain complex. The ADCCP communuication processor apparatus accepts AUTODIN Mode 1, 80 chracter block by block aerial transmission from PARCS DTC (channels 2 and 3), reformats the messages into an ADCCP frame structure, and multiplexes and interleaves the transmission to the NCMC computer on a prime data link.

GRA

N85-25710# California Univ., Livermore. Lawrence Livermore Lab.

PARAMETERIZATION OF A TRANSIENT ELECTROMAGNETIC FACILITY AND TEST ANTENNAS FROM TRANSIENT DATA

R. M. Bevensee, J. V. Candy, G. A. Clark, L. O. Martin, and R. J. King Dec. 1984 6 p refs Presented at the Instrumentation Measurement Technology Conf., Tampa, Fla., 20-22 Mar. 1985 (Contract W-7405-eng-48)

(DE85-006231; UCRL-91461; CONF-850340-1) Avail: NTIS HC A02/MF A01

The Lawrence Livermore National Laboratory is characterizing antennas in their environments from transient reflectometry and scatter data taken on an Electromagnetic Transient Facility (EMTF). The linear-system ARMAX modeling of the entire EMTF and derivation of the frequency-domain equivalent circuit of an antenna at its load port are described. The EMTF is decomposed into blocks and model identification of each is achieved by data preprocessing, model-order testing, parameter estimation, prediction error tests for fit validation, and finally ensemble data tests on a well-understood electromagnetic dipole for overall EMTF model validation. Various special ARMAX methods for modeling the equivalent circuit are compared, with emphasis on a special nonlinear least-squares algorithm. Data processing rules are given. Results for a 30 cm monopole antenna are presented. Problems are summarized in the conclusions. DOE

N85-25711# Alcatel Thomson Espace, Courbevoie (France).

ADAPTATION OF BIT ERROR RATE BY CODING Final Report

A. Marguinaud and G. Sorton Paris ESA Jul. 1984 125 p refs (Contract ESTEC-5481/83/NL-GM)

(ESA-CR(P)-1970) Avail: NTIS HC A06/MF A01

The use of coding in spacecraft wideband communication to reduce power transmission, save bandwith, and lower antenna specifications was studied. The feasibility of a coder decoder functioning at a bit rate of 10 Mb/sec with a raw bit error rate (BER) of 0.001 and an output BER of 0.000000001 is demonstrated. A single block code protection, and two coding levels protection are examined. A single level protection BCH code with 5 errors correction capacity, 16% redundancy, and interleaving depth 4 giving a coded block of 1020 bits is simple to implement, but has BER = 0.000000007. A single level BCH code with 7 errors correction capacity and 12% redundancy meets specifications, but is more difficult to implement. Two level protection with 9% BCH outer and 10% BCH inner codes, both levels with 3 errors correction capacity and 8% redundancy for a coded block of 7050 bits is the most complex, but offers performance advantages.

Author (ESA)

N85-25712# Institute for Telecommunication Sciences, Boulder, Colo.

STANDARDS IN PROCESS: FOUNDATION AND PROFILES OF ISDN (INTEGRATED SERVICES DIGITAL NETWORK) AND OSI (OPEN SYSTEMS INTERCONNECTION) STUDIES

D. M. Cerni Dec. 1984 259 p refs

(PB85-165041/GAR; NTIS/Rept-84/170) Avail: NTIS HC A122/MF A01 CSCL 17B

Telecommunication and computer technologies are merging, stimulating such global communication projects as the Integrated Services Digital Network (ISDN) and the Open Systems Interconnection (OSI) Reference Model. The systems of standards needed to ensure worldwide success of these projects are being developed. These efforts, of unprecedented complexity, are demanding an increase in knowledgeable dedicated standards workers. This report offers background material on the meaning, significance, and changing nature of standards and their development, both in the United States and internationally. Author (GRA)

N85-25332# Joint Publications Research Service, Arlington, Va.

DEVELOPMENT OF TV SYSTEMS FOR SPACECRAFT Abstract Only

V. Krichevskiy *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 93 Transl. into ENGLISH from Izv. (USSR), 25 Oct. 1984 p 3 (For primary document see N85-25284 15-12)

Avail: NTIS HC A08/MF A01

N85-25337# Joint Publications Research Service, Arlington, Va.

IONOSPHERE EFFECTS MAY REPLACE SOME COMMUNICATIONS SATELLITES Abstract Only

V. Lagovskiy *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 103-104 Transl. into ENGLISH from Sotsialisticheskaya Ind. (USSR), 20 Dec. 1984 p 6 (For primary document see N85-25284 15-12)

Avail: NTIS HC A08/MF A01

N85-25575# Joint Publications Research Service, Arlington, Va.

INTERFERENCE IMMUNITY OF OPTICAL RADAR SYSTEM WITH PHASED ANTENNA ARRAY Abstract Only

Ya. V. Alishev and V. Ye. Yamaykin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 8 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelectron. (Kiev), v. 27, no. 10, Oct. 1984 p 22-27 (For primary document see N85-25565 15-31)

Avail: NTIS HC A05/MF A01

N85-25576# Joint Publications Research Service, Arlington, Va.

COPHASAL HORIZONTAL WIDEBAND ARRAY ANTENNAS FOR TRANSMITTING WITH ASYMMETRIC OUTPUT Abstract Only

S. P. Belousov, G. A. Kliger, and N. A. Eskin *In its* USSR Rept.: Electron and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 9 refs Transl. into ENGLISH from Electrosvyaz (Moscow), no. 9, Sep. 1984 p 52-55 (For primary document see N85-25565 15-31)

Avail: NTIS HC A05/MF A01

N85-25577# Joint Publications Research Service, Arlington, Va.

ANTENNA WITH OUTBOARD EXCITER FOR 3.4-13.25 GHz FREQUENCY RANGE Abstract Only

A. A. Timofeyeva, I. A. Kozlovskaya, and Z. K. Khlopkova *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 9-10 Transl. into ENGLISH from Elektrosyvaz (Moscow), no. 8, Aug. 1984 p 22-28 (For primary document see N85-25565 15-31)

Avail: NTIS HC A05/MF A01

N85-25578# Joint Publications Research Service, Arlington, Va.

CONVERTERS OF SUM/DIFFERNCE OF CODES TO FREQUENCY Abstract Only

G. L. Sedletskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 11 refs Transl. into ENGLISH from Elecktrosvyaz (Moscow), no. 8, Aug. 1984 p 54-56 (For primary document see N85-25565 15-31)

Avail: NTIS HC A05/MF A01

N85-25580# Joint Publications Research Service, Arlington, Va.

ADAPTIVE DETECTION OF NOISE SIGNAL ACCORDING TO NEUMANN-PEARSON CRITERION Abstract Only

Yu. A. Padiryakov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 13 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Kiev), v. 27, no. 10, Oct. 1984 p 71-73 (For primary document see N85-25565 15-31)

Avail: NTIS HC A05/MF A01

N85-25582# Joint Publications Research Service, Arlington, Va.

AUTOMATION OF SERVICIBILITY OF RADIO-RELAY STATION

EQUIPMENT Abstract Only
A. G. Uryev, Ye. I. Mishkin, and G. Ye. Itkis *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 15 refs Transl. into ENGLISH from Electrosvyaz (Moscow), no. 8, Aug. 1984 p 11-14 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25584# Joint Publications Research Service, Arlington, Va.
FREQUENCY SELECTION FOR DISPERSION SIGNAL IN SATELLITE COMMUNICATION LINES Abstract Only
V. M. Dorofeyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-8-005) 27 Mar. 1985 p 31 refs Transl. into ENGLISH from Electrosvyaz (Moscow), no. 9, Sep. 1984 p 8-10 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25585# Joint Publications Research Service, Arlington, Va.
INTERKOSMOS PROGRAM OF SPACE COMMUNICATION DEVELOPMENT Abstract Only
L. Ya. Kantor *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-85-005) 27 Mar. 1985 p 45 refs Transl. into ENGLISH from Electrosvyaz (Moscow), no. 9, Sep. 1984 p 1-3 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25586# Joint Publications Research Service, Arlington, Va.
PRELIMINARY ESTIMATION OF MUTUAL INTERFERENCE BETWEEN FIXED SATELLITE SERVICE SYSTEMS Abstract Only
S. V. Borodich *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 45-46 refs Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 9, Sep. 1984 p 4-7 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25587# Joint Publications Research Service, Arlington, Va.
SURVEY OF DEVELOPMENTS IN TROPOSPHERIC COMMUNICATION APPARATUS Abstract Only
A. S. Nemirovskiy and V. V. Markov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 50 refs Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 11, Nov. 1984 p 60 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-26591*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LACK OF COMMUNICATION
James Aguilar *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 5-6 (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 17B

N85-26598*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THIN ROUTE PROJECT
S. Gregory Felix *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 47-51 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 17B

N85-26600*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMMUNICATIONS
Sadie Hathorn *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 59-61 (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 17B

N85-25653# Joint Publications Research Service, Arlington, Va.
A SURVEY OF RADAR ECM AND ECCM
Li Nengjing and Zhang Yiting *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-013) 1 May 1985 p 27-34 refs Transl. into ENGLISH from Dianzi Xuebao (Beijing), v. 13, no. 1, Jan. 1985 p 99-109 (For primary document see N85-25652 15-31)
Avail: NTIS HC A07/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N85-25713 Central Electricity Generating Board, London (England).
TRANSIENTS DURING THE SWITCHING OF SF6-INSULATED ISOLATING SWITCHES
H. Luehrmann 7 Mar. 1985 24 p refs Transl. into ENGLISH from ETZ Arch. (West Germany), v. 3, no. 7, 1981 p 209-215
(BLL-CE-Trans-7986-(9022.09)) Avail: British Library Lending Div., Boston Spa, England

The transients produced by SF6 insulated isolators being switched were measured using wide-band voltage dividers, and the effect of the test circuit parameters on these transients was determined. The above was used to assess the maximum voltages with respect to earth, which the switchgear insulation has to withstand. The maximum overvoltage factor, which is defined as the ratio of the peak overvoltage to earth to the peak power frequency voltage, was found to be only 1.68. The transients were calculated in parallel with the measurements. A comparison of the results show that the equivalent circuits on which the calculation was based gave a relatively good description of the basic phenomena. Author

N85-25714 Central Electricity Generating Board, London (England).
EXPERIMENTAL INVESTIGATION OF THE ELECTRIC BREAKDOWN IN SF6
W. Pfeiffer and W. Schmitz 7 Mar. 1985 15 p refs Transl. into ENGLISH from Elektrotech. Z. Ausg. (West Germany), v. 99, no. 11, 1978 p 681-685
(BLL-CE-Trans-7987-(9022.09)) Avail: British Library Lending Div., Boston Spa, England

Breakdown development at low over-pressure was investigated with spatially and temporally resolved measurements. The apparatus used made it possible to perform simultaneous electrical and optical measurements with a co-ordination time uncertainty of 0.3 ns. The high system sensitivity enabled the investigations to be extended into the predischarge region. The discharge phenomena can be used to separate the breakdown process into three ranges with distinctly different development stages. Within these ranges it was possible to associate two types of breakdown development with the breakdown mechanisms proposed by Townsend and Raether, for which the development of discharges during channel formation can now be described. Author

N85-25715# New South Wales Univ., Kensington (Australia). School of Electrical Engineering and Computer Science.
STATISTICAL ANALYSIS OF PARTIAL DISCHARGE INCEPTION IN HIGH VOLTAGE Abstract Only M.S. Thesis
Steven Lloyd Jones Mar. 1983 3 p refs
Avail: NTIS HC A02/MF A01

Research into the application of statistical techniques to the measurement and analysis of the occurrence of partial discharges (PDs) in insulations under test is discussed. In particular, the uncertain region of PD inception was examined to establish the effect of test variables such as voltage, time, insulation thickness and temperature. The test results show that statistical techniques and inception definition provide a versatile and accurate means of PD measurement and analysis. R.J.F.

N85-25716# New South Wales Univ., Kensington (Australia). School of Electrical Engineering and Computer Science.
THE PERFORMANCE OF AN ALTERNATING-CURRENT

THYRISTOR-CONTROLLED MOTOR Abstract Only M.S. Thesis
C. G. J. Streatfield Mar. 1984 3 p
Avail: NTIS HC A02/MF A01

A parallel-connected, thyristor-controlled, variable-speed synchronous motor with its associated control circuitry was constructed. The dimensions of the machine were measured and used, together with the magnetization characteristic, as the basis for calculations of the electrical parameters of the stator circuit. Results obtained from these calculations agree reasonably well with values obtained from static measurements. Factors limiting the performance of the motor were identified as well as two different rotor angles for quasi-stable conditions on no-load. A hunting phenomenon was also investigated and some calculations are included which can assist in determining the time-period of rotor oscillations. Experiments with an induction motor suggest it would be more usable than the synchronous motor. A.R.H.

N85-25717# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
PSEUDO BIPOLAR NICKEL-CADMIUM BATTERIES USED AS FILTER ELEMENTS TO PULSED CURRENT LOADS Final Report, 1 May - 30 Sep. 1984
M. B. Cimino and G. M. Gearing Wright-Patterson AFB, Ohio AFWAL Nov. 1984 103 p
(AD-A151192; AFWAL-TR-84-2094) Avail: NTIS HC A06/MF A01 CSCL 10/3

This investigation consisted of several tests of specially fabricated nickel-cadmium batteries having circular disk type electordes. These batteries were evaluated as filter elements between a constant current power supply and a 5-hertz pulsed load demanding approximately twice the power supply current during the load on portion of the cycle. Short tests lasting 10,000 cycles were conducted at up to a 21 C rate and an equivalent energy density of over 40 Joules per pound. In addition, two batteries were subjected to 10,000,000 charge/discharge cycles, one at 6.5 C rate and the other at a 13 C rate. Assuming an electrode to battery weight ratio of 0.5, these tests represent an energy density of about 7 and 14 joules per pound respectively. Energy density, efficiency, capacitance, average voltage, and available capacity were tracked during these tests. After 10,000,000 cycles, capacity degradation was negligible for one battery and about 20% for another. Cadmium electrode failure may be the lifetime limiting factor extremely low depth of discharge cycling. The output was examined, and a simple equivalent circuit is proposed. GRA

N85-25718# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EROSION OF ELECTRODES DUE TO SWITCHING OF CAPACITOR-BANK DISCHARGE CIRCUITS
G. M. Goncharenko and Y. N. Prokhorov 7 Feb. 1985 8 p Transl. into ENGLISH from Tr. Mosk. Energ. Inst., Tekh. Vysokikh Napryazheniy (USSR), no. 114, 1972 p 86-88
(AD-A151207; FTD-ID(RS)T-0531-84) Copyright. Avail: NTIS HC A02/MF A01 CSCL 09/3

The erosion of the contact surfaces of the electrodes in switches affects not only the service life of the electrodes and their insulation but also the basic characteristics of the switches - there is a variation in static breakdown voltages, operation lag time, and variation in the operation time. One of the main quantitative characteristics of erosion is the mass of metal ejected from the surface of the electrode. This work is devoted to an experimental determination of the mass of metal ejected from the surface of electrodes made from different materials by weighing on a VT-1 balance and visual observation of the surfaces being eroded. The geometry of the electrodes and the size of the gap between them modeled the construction of the electrodes and the conditions of the displacement of craters under the effect of electromotive forces in the switches of the discharge circuits of large capacitor banks. GRA

N85-25719# State Univ. of New York, Buffalo. Dept. of Electrical and Computer Engineering.
FIELD-INDUCED PHENOMENA IN ELECTRICAL INSULATION Annual Scientific Report, 30 Sep. 1983 - 29 Sep. 1984
J. R. Laghari, W. J. Sarjeant, and R. K. Gupta 29 Sep. 1984 128 p
(Grant AF-AFOSR-0344-83)
(AD-A151234; AFOSR-85-0129TR; ASR-1) Avail: NTIS HC A07/MF A01 CSCL 20/3

A review and an interpretation of the existing literature on dielectrics and dielectric breakdown was completed. Experiments were planned in light of the above interpretation and an experimental system was designed and developed. Experiments were then conducted on the time-to-break and breakdown of composite laminate insulation structures under pulsed and alernating voltages. Corona inception and extinction signatures were simultaneously obtained and evaluated. In view of the future experiments planned, theoretical and computer studies were carried out to determine the rise in temperature of laminate insulation structures under pulsed loads. Rise. GRA

N85-25720# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
CONVERSION OF ALGORITHMS TO CUSTOM INTEGRATED CIRCUIT DEVICES Final Report, 1 Nov. 1983 - 31 Oct. 1984
J. Allen 30 Jan. 1985 34 p
(Contract F49620-84-C-0004)
(AD-A151288; AFOSR-85-0175TR) Avail: NTIS HC A03/MF A01 CSCL 09/5

This project is devoted to the development of computer-aided design techniques at a fundamental and basic level for the creation of high-performance custom integrated circuits to be used for digital signal processing. The project takes a fundamental point of view in considering the design process to consist of a set of transformations between abstract representations at various levels. There are five major of the work. First, research on specification languages that characterize the functionality of the algorithm to be performed by the chip are considered. The second focus is on architectural exploration, whereby architectures derived from the input functional specification can be modified without any possibility of changing the desired input functionality. In the third area, we have focused on techniques for generation and composition of cells. The fourth area of emphasis is the characterization and generation of optimum circuit performance. Finally, attention was focused on the design and construction of special architectures for computer aided design. The report describes these activities in detail and unifies them together in an overall perspective of computer aided design for high performance digital signal processing applications. GRA

N85-25721# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
ANALYSIS OF WAVEGUIDE DISCONTINUITIES BY THE METHOD OF MOMENTS
H. Auda, R. F. Harrington, and J. R. Mautz Jul. 1984 138 p
(Contract N00014-76-C-0225)
(AD-A151499; SYRU/DECE/TR-84/7; TR-26) Avail: NTIS HC A07/MF A01 CSCL 09/1

Three systems of waveguide discontinuities are considered. The first system is that of multiple apertures of arbitrary shape in the transverse plane between two cylindrical waveguides. The second system consists of metallic obstacles in a rectangular waveguide that are uniform along the narrow side of the waveguide but are otherwise of arbitrary shape and thickness, i.e., a system of inductive posts. The third system consists of metallic obstacles in a rectangular waveguide that are uniform along the broad side of the waveguide, but are otherwise of arbitrary cross section and thickness, i.e., a system of capacitive posts. Common between the first and second systems are the inductive windows and strips in a rectangular waveguide, and between the first and third systems are the capacitive windows and strips in a rectangular waveguide. GRA

N85-25722# Aerospace Corp., El Segundo, Calif. Electronics Research Lab.
DEFOCUSING LOSSES IN A LOG PERIODIC-FED REFLECTOR
R. B. Dybdal 20 Dec. 1984 22 p
(Contract F04701-83-C-0084)
(AD-A151616; TR-0084A(5925-06)-1; SD-TR-84-51) Avail: NTIS HC A02/MF A01 CSCL 09/5

Log periodic designs are a well established wideband antenna technology, but one in which the phase center travels along the structure as the frequency varies. When a log periodic antenna is used as a feed for a reflector antenna, the phase center location cannot be maintained at the reflector focus over the frequency range and defocusing results. The purpose of this analysis is to quantify the defocusing loss for a long periodic-fed reflector. The analysis presented compares favorably with measured results. GRA

N85-25723# Department of the Army, Washington, D. C.
MONOLITHIC PLANAR DOPED BARRIER LIMITER Patent Application
S. Dixon, Jr., T. R. AuCoin, and R. J. Malik, inventors (to Army) Filed 25 Feb. 1985 11 p
(AD-D011578; US-Patent-Appl-SN-705267) Avail: NTIS HC A02/MF A01 CSCL 09/1

This patent application describes a passive millimeter wave image guide power limiter comprising a length of dielectric transmission line or waveguide for millimeter wave frequencies located on a relatively thin conductive ground plane forming thereby an image guide and including a planar doped barrier diode structure formed in the dielectric transmission line with the planar doped barrier structure being integrally grown in a slot milled in the constituent material, i.e., gallium arsenide, of the waveguide transversely across the width dimension thereof so as to be orientated perpendicular to the flow of RF power being propagated along its length dimension. The planar doped barrier structure becomes conductive at a predetermined power level to reflect any further incident RF power back toward the power source. GRA

N85-25724# Department of the Air Force, Washington, D.C.
FREQUENCY SELECTIVE SIGNALS-TO-NOISE ENHANCER/ LIMITER APPARATUS Patent Application
S. N. Stitzer, inventor (to Air Force) Filed 27 Nov. 1984 12 p
(AD-D011583; US-Patent-Appl-SN-675171) Avail: NTIS HC A02/MF A01 CSCL 09/5

A signal-to-noise enhancer is disclosed which can be used in frequency memory loops to prevent loop capture by noise. If a frequency selective limiter is incorporated in the loop, more than one signal can be stored simultaneously because the limiter prevents the loop amplifier from saturating. At present, the limiter must be a separate device. The frequency selective signal-to-noise enhancer/limiter apparatus comprises an enhancer apparatus and a limiter apparatus and a limiter apparatus on a single substrate, using a single pair of magnets to bias both units. GRA

N85-25725# Department of the Air Force, Washington, D.C.
WAVELENGTH DEPENDENT, TUNABLE, OPTICAL TIME DELAY SYSTEM FOR ELECTRICAL SIGNALS Patent Application
R. Soref, inventor (to Air Force) Filed 6 Feb. 1985 21 p
(AD-D011584; US-Patent-Appl-SN-698979) Avail: NTIS HC A02/MF A01 CSCL 20/6

Disclosed is a wavelength dependent, tunable, optical time delay system for electronic signals having a conversion/tuning unit for converting an incoming electrical signal into an optical signal as well as selectively varying the wavelength of the optical signal; a single-mode, high dispersion optical fiber for receiving the optical signal and through which the optical signal propagates at a speed dependent upon its wavelength; and a detector/ convertor for converting the optical signal back to an electrical outlet. By utilizing a separate preselected electronic control-field fed to the conversion/tuning unit, the wavelength of the optical signal entering the fiber can be varied over a preselected wavelength band of interest. By selectively varying the wavelength of the optical signal, the electrical signal can be effectively and rapidly time delayed as desired in response to the electronic signal. GRA

N85-25726# Department of the Army, Washington, D. C.
ADJUSTMENT OF THE FREQUENCY-TEMPERATURE CHARACTERISTICS OF CRYSTAL OSCILLATORS Patent Application
A. Ballato, inventor (to Army) Filed 28 Feb. 1985 18 p
(AD-D011588; US-Patent-Appl-SN-707107) Avail: NTIS HC A02/MF A01 CSCL 09/5

The patent application relates generally to temperature compensated crystal oscillators utilizing piezoelectric resonators and more particularly to the alteration of the frequency-temperature characteristic of a piezoelectric resonator of a temperature compensated crystal oscillator. The frequency-temperature piezoelectric resonator in a temperature compensated crystal oscillator is adjusted by the inclusion of an equivalent inductive reactance connected to an oscillator circuit, with the equivalent inductive reactance being realized in the form of an inductorless Maxwell type bridge circuit containing the resonator. Such an arrangement provides a much larger variation in the temperature with a conventional capacitor in series with the piezoelectric resonator. GRA

N85-25727# Hughes Aircraft Co., El Segundo, Calif. Electro-optical and Data Systems Group.
ADVANCED CAPACITORS Final Report, Apr. 1980 - Jun. 1984
J. B. Ennis and R. S. Buritz Wright-Patterson AFB, Ohio AFWAL Oct. 1984 197 p
(Contract F33615-79-C-2081)
(AD-A151709; HAC-FR84-76-621; AFWAL-TR-84-2058) Avail: NTIS HC A09/MF A01 CSCL 09/1

This report describes an experimental program to develop and test advanced dielectric materials for capacitors for airborne power systems. Five classes of capacitors were considered: high rep rate and low rep rate pulse capacitors for use in pulse-forming networks, high voltage filter capacitors, high frequency AC capacitors for series resonant inverters, and AC filter capacitors. To meet these requirements, existing dielectric materials were modified, and new materials were developed. The initial goal was to develop an improved polysulfone film with fewer imperfections that could operate at significantly higher electrical stresses. It was shown that contaminants enter the film via the resin and solvent, and that they can be partially removed. As far as developed, however, these treatments did not significantly improved the breakdown characteristics. The technique of casting films on a roughened drum was demonstrated, and found useful in preparing textured films -- the first step toward a replacement for Kraft paper. A new material, Ultem, was proposed for use in high energy density capacitors. This new polyetherimide resin has properties similar to polysulfone and polyimide, with improvement in breakdown characteristics and temperature capability. This material was selected for further study in model capacitor designs. GRA

N85-25728# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ANALYSIS OF THE CAPABILITY TO EFFECTIVELY DESIGN COMPLEMENTARY METAL OXIDE SEMICONDUCTOR INTEGRATED CIRCUITS M.S. Thesis
M. L. McConkey Dec. 1984 148 p
(AD-A151832; AFIT/GE/ENG/84D-44) Avail: NTIS HC A07/MF A01 CSCL 09/5

A complete CMOS/BULK design cycle has been implemented and fully tested to evaluate its effectiveness and a viable set of computer-aided design tools for the layout, verification, and simulation of CMOS/BULK integrated circuits. This design cycle is good for p-well, n-well, or twin-well structures, although current fabrication technique available limit this to p-well only. BANE, an integrated layout program from Stanford, is at the center of this design cycle and was shown to be simple to use in the layout of CMOS integrated circuits (it can be also used to layout NMOS integrated circuits). A flowchart was developed showing the design

cycle from initial layout, through design verification, and to circuit simulation using NETLIST, PRESIM, and RNL from the University of Washington. A CMOS/BULK library was designed and includes logic gates that were designed and completely tested by following this flowchart. Also designed was an arithmetic logic unit as a more complex test of the CMOS/BULK design cycle. GRA

N85-25729# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DESIGNING VLSI (VERY LARGE SCALE INTEGRATED) CIRCUITS FOR TESTABILITY M.S. Thesis
M. Kaplan Dec. 1984 137 p
(AD-A151834; AFIT/GE/ENG/84D-39) Avail: NTIS HC A07/MF A01 CSCL 09/5

Very large scale integrated circuits are difficult to test once fabricated. This is due to the large number of internal circuit nodes that are not accessible as probe points, and the small number of primary inputs and outputs available to exercise and observe these internal nodes. Methods to develop test vectors for such circuits (e.g., d-Algorithm) are both difficult and time consuming. For this reason a method is needed to design circuits which are highly testable or self-testing. Using computer aided design tools, a circuit is designed which exhibits a self-test scheme. The design concepts used include a level-sensitive scan design and signature analysis. When completed the circuit is evaluated from the standpoint of how much design effort, circuit area used, and test effort compares with the same parameters for a circuit without testability characteristics included. Environmental dependency (the conditions of circuit operation) is an important consideration when determining if self-test capability is warranted. When the circuit is one which is inaccessible after deployment or needed without much testing time available, self-test capability is worthwhile. This is a very necessary capability for satellite systems or systems which must be replaced without delay (e.g., component of F-16 fire control system). GRA

N85-25730# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DEVELOPMENT OF A DIGITALLY COMPENSATED SAW OSCILLATOR (DCSO) TO PROVIDE TEMPERATURE STABLE FREQUENCY M.S. Thesis
W. D. Cowan Dec. 1984 133 p
(AD-A151907; AFIT/GE/ENG/84D-22) Avail: NTIS HC A07/MF A01 CSCL 09/5

A single circuit board Digitally Compensated SAW (Surface Acoustic Wave) Oscillator(DCSO) running at 300 MHz demonstrated 30 parts per million temperature stability over a portion of its temperature range. A thick film hybrid controller circuit, for use in the DCSO, was designed and tested. This circuit, referred to as the AFIT IC, consists of two commercial TTL prescalers and a custom NMOS integrated circuit. The TTL prescaler circuits of the AFIT IC were found to be operational, but the failure of the NMOS controller IC to meet design criteria prevented demonstration of a fully integrated DCSO. Off board control circuitry was designed, using portions of the AFIT IC (including part of the NMOS chip), to continue the project. The DCSO was then calibrated and tested over a 0 to 70 degrees Centigrade range. Calibration and testing were facilitated by computer interfaces to the DCSO, and electronic thermometer, and a frequency counter. Despite erroneous temperature behavior of one oscillator loop, compensation to within 30 parts per million over a portion of the temperature range was accomplished for the 300 MHz DCSO. GRA

N85-25731# Naval Postgraduate School, Monterey, Calif.
CSMP (CONTINUOUS SYSTEM MODELING PROGRAM) MODELING OF BRUSHLESS DC MOTORS M.S. Thesis
S. M. Thomas Sep. 1984 89 p
(AD-A152043; AD-E801104) Avail: NTIS HC A05/MF A01 CSCL 10/2

Recent improvements in rare earth magnets have made it possible to construct strong, lightweight, high horsepower DC motors. This has occasioned a reassessment of electromechanical actuators as alternatives to comparable pneumatic and hydraulic systems for use in flight control actuators for tactical missiles. This thesis develops a low-order mathematical model for the simulation and analysis of brushless DC motor performance. This model is implemented in CSMP language. It is used to predict such motor performance curves as speed, current and power versus torque. Electronic commutation based on Hall effect sensor positional feedback is simulated. Steady state motor behavior is studied under both constant and variable air gap flux conditions. The variable flux takes two different forms. In the first case, the flux is varied as a simple sinusoid. In the second case, the flux is varied as the sum of a sinusoid and one of its harmonics. GRA

N85-25732# Department of the Air Force, Washington, D.C.
LENGTH DEPENDENT, OPTICAL TIME DELAY/FILTER DEVICE FOR ELECTRICAL SIGNALS Patent Application
R. Soref, inventor (to Air Force) Filed 6 Feb. 1985 27 p
(AD-D011594; US-Patent-Appl-SN-698977) Avail: NTIS HC A03/MF A01 CSCL 20/3

In this patent application, a length dependent, optical time delay/filter device for electrical signals having a single integrated optical switching circuit and only two optical time delay components connected thereto is discussed. The optical time delay components are each made up of a plurality of optical fibers of varying lengths. Depending upon which fibers an optical signal (converted from an incoming electrical signal) passes through determines the time of travel of the optical signal through the device. This optical signal is then converted back into an electrical output signal which is as a result thereof, time delayed/filtered. GRA

N85-25733# Department of the Air Force, Washington, D.C.
PARALLEL PROGRAMMABLE CHARGE DOMAIN DEVICE Patent Application
T. L. Vogelsong, inventor (to Air Force) Filed 7 Dec. 1984 19 p
(AD-D011599; US-Patent-Appl-SN-679327) Avail: NTIS HC A02/MF A01 CSCL 09/1

This patent application discloses programmable signal processing apparatus for multiplying a sampled analog signal by a multiple bit digital word coefficient. All signal processing operations are accomplished by the splitting, routing and combining of charge packets formed in a charge domain device. GRA

N85-25734# Argonne National Lab., Ill. Mathematics and Computer Science Div.
SIGNAL FLOW MODEL FOR SEQUENTIAL LOGIC BUILT FROM COMBINATIONAL LOGIC ELEMENTS AND ITS IMPLEMENTATION IN PROLOG
John R. Gabriel and Philip R. Roberts Sep. 1984 17 p refs
(Contract W-31-109-eng-38)
(DE85-005792; ANL-84-89) Avail: NTIS HC A02/MF A01

A signal flow model is described that uses memory devices from combinational logic. The implementation of this model in Prolog is also presented. DOE

N85-25735# California Univ., Livermore. Lawrence Livermore Lab.
TUTORIAL DISCUSSION OF ELECTRONIC SAMPLING SYSTEMS FOR RECORDING WIDE-BANDWIDTH TRANSIENT SIGNALS
A. S. Blum Jul. 1984 36 p
(Contract W-7405-eng-48)
(DE85-006577; UCRL-53596) Avail: NTIS HC A03/MF A01

The fidelity with which very fast transient signals can be recorded by linear, time-varying, sampling systems operating near the speed limit of the electronics is characterized by a frequency domain transfer function. The transfer function is the Fourier transform of a suitably defined impulse response. The derivation of this result is reviewed, and a prototypic system is studied. Comparisons are made with oscillographic recording. DOE

N85-25736# Sandia Labs., Albuquerque, N. Mex.
ELECTRONIC PROPERTIES OF NEW ORGANIC CONDUCTORS
L. J. Azevedo, E. I. Venturini, J. F. Kwak, J. E. Schirber, J. M. Williams (Argonne National Lab.), H. H. Wang (Argonne National

Lab.), and P. E. Reed (Argonne National Lab.) 1984 11 p refs Presented at the Intern. Chem. Congr. of Pacific Basin Soc., Honolulu, 16 Dec. 1984
(Contract DE-AC04-76DP-00789)
(DE85-005590; SAND-84-08620; CONF-841210-11) Avail: NTIS HC A02/MF A01

A study of the electronic properties of a new organic conductor, (BEDT-TTF)2BrO4, using magnetic resonance techniques and also the organic superconductor (BEDT-TTF)2I3 was undertaken. Proton magnetic resonance experiments on (BEDT-TTF)2BrO4 have resolved individual proton lines without the aid of line narrowing techniques. The electron spin resonance line is very narrow and shows a frequency independent low temperature broadening in the low temperature regime. The ESR broadening is strongly pressure dependent, being suppressed to lower temperature with the application of pressure. We have used radio frequency techniques to monitor the pressure dependence of the superconducting transition temperature, T/sub c/, in (BEDT-TTF)2I3 and find that T/sub c/ is suppressed to below 1K with the application of less than 0.5 kbar of pressure. In addition, we find a magnetic transition at 7K above a pressure of .5 kbar. DOE

N85-25737# Communications Satellite Corp., Fort Lauderdale, Fla.
MULTIKILOWATT HYDROGEN-NICKEL OXIDE BATTERY SYSTEM
J. D. Dunlop 1984 26 p refs
(Contract DE-AC04-76DP-00789)
(DE85-003339; SAND-84-7176C) Avail: NTIS HC A03/MF A01

A favorable assessment of the technology potential of the H2-NiO battery for terrestrial applications was developed. This program uses a multicell design approach that differs significantly from the aerospace individual pressure vessel design. A number of experimental 100-Ah cells were built to evaluate the new design concepts and components, and results from these experimental cells provided the input needed for a multicell battery design. several experimental 100-Ah cells and one 6-cell battery were delivered to Sandia National Laboratories for life testing. DOE

N85-25738# Los Alamos Scientific Lab., N. Mex.
TRANSIENT VOLTAGE OSCILLATIONS IN COILS
P. Chowdhuri 1985 7 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, Mar. 1985
(Contract W-7405-eng-36)
(DE85-006715; LA-UR-85-397; CONF-850310-11) Avail: NTIS HC A03/MF A01

Magnet coils may be excited into internal voltage oscillations by transient voltages. Such oscillations may electrically stress the magnet's dielectric components to many times it normal stress. This may precipitate a dielectric failure, and the attendant prolonged loss of service and costly repair work. Therefore, it is important to know the natural frequencies of oscillations of a magnet during the design stage, and to determine whether the expected switching transient voltages can excite the magnet into high-voltage internal oscillations. The series capacitance of a winding significantly affects it natural frequencies. However, the series capacitance is difficult to calculate, because it may comprise complex capacitance network, consisting of intra- and inter-coil turn-to-turn capacitances of the coil sections. A method of calculating the series capacitance of a winding is proposed. This method is rigorous but simple to execute. The time-varying transient voltages along the winding are also calculated. DOE

N85-25739# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
MICROWAVE TUBES: LITERATURE SURVEY NO. 5 COMPRISING YEAR 1983
Herbert Steyskal Nov. 1984 170 p refs
(FOA-C-30377-E; ISSN-0347-3708) Avail: NTIS HC A09/MF A01

About 720 references on generation/amplification of microwaves (UHF to sub-mm waves) are discussed. Conventional microwave tubes including gyrotrons as well as less conventional tubes like EBS-tubes, orotrons, and reflex triodes are covered. Free electron masers and other concepts of generating/amplifying microwave power indicate the state of the art and the trends of future development. Technological issues like electron guns, cathodes and electron beams up to GW-levels are included. Author (ESA)

N85-25740# Spar Aerospace Ltd., Ste-Anne-de-Bellevue (Quebec). Satellite and Aerospace Systems Div.
BONDED STRIPLINE POWER SPLITTER FOR ERS-1 Final Report
Minh Quyen Tang 8 Aug. 1984 41 p
(Contract ESA-4451/80/NL-PP(SC))
(RML-009-84-124; ESA-CR(P)-1969) Avail: NTIS HC A03/MF A01

Four nominally identical bonded stripline power splitters were developed for the ERS-1 antenna. The two dielectric sheets involved in fabricating the triplate sandwich are fused together. The possibility of warping or air gaps developing due to plastic flow deformations under pressure is eliminated. The ground planes are plated on the dielectric including the edges. This provides a very effective RF seal. Plated through holes are used to electrically interconnect the ground planes without using screws as inductive posts. Author (ESA)

N85-25741# Danish Research Center for Applied Electronics, Hoersholm.
ANALYSIS AND TESTING OF THE THERMAL PROPERTIES OF SPACE BATTERY CELLS, PHASE B, DRAFT Final Report
A. Laursen and P. Halkjaer Jacobsen Paris ESA May 1984 61 p refs Sponsored in part by ESA
(Contract ESA-4981/82/HL-JS(SC))
(ESA-CR(P)-1971) Avail: NTIS HC A04/MF A01

Thermal studies on SAFT cells NiH2 HRN 42S2, AgH2 HRA 26S, and NiCd Vo24 are summarized. Measurement of heat flow in cells during cyclic operation; calculation of thermal capacity; and measurement of thermal capacity are described. Low orbit cycling and geostationary orbit cycling tests were performed. Author (ESA)

N85-25742# Friedrichsfeld G.m.b.H., Mannheim (West Germany). Steinzeug- und Kunststoffwerke.
PRODUCTION TECHNOLOGY OF AN ELECTROLYTE FOR Na/S BATTERIES Final Progress Report, Feb. 1984
Helmut Mayer and Arno Reckziegel Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 74 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-277; ISSN-0340-7608; PR-2) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15.50

A production method for a ceramic electrolyte for Na/S batteries was developed. The ceramic materials are based on MgO and MgAl2O4 (spinel). A dense MgO-ceramic (purity > 99.5%) shows no damage after 100 hr at > 1500 C in an Na2O-vapor atmosphere. Cartridges with a sintered density > 340 g/cc achieve > 50 burn cycles. A small scale production line for 1000 cartrigdes with a monthly output of 250 parts is described. Variations of powder properties cause high scrap rates and a large variation of sintered densities. A short quality test based on internal pressure was devised. Compared with MgO the nonhygroscopic spinel has production advantages, but is expensive. Author (ESA)

N85-25743# Valvo Roehren- und Halbleiterwerke der Philips G.m.b.H., Hamburg (West Germany). Produktbereich MOS-ICS.
DEVELOPMENT OF SIMULATION PROCEDURES FOR VLSI SYSTEMS (TIMING SIMULATION) Final Report, Jan. 1984
Walter Anheier and Rainer Laur Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 119 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-84-297; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25

A timing simulator, MEDUSA-T, based on the modular network analysis program MEDUSA was developed. The input language is compatible with ESPICE. A simplified MOS-model which is sufficiently simple for timing analysis and exact enough for circuit simulation is used. The model is derived from the ESPICE short channel MOS model. Concepts of modular analysis are realized using logic analysis for timing and circuit simulation. Investigations on modular procedures to couple circuit and timing simulation lead to a hybrid simulation program. Author (ESA)

N85-25744# Valvo Roehren- und Halbleiterwerke der Philips G.m.b.H., Hamburg (West Germany). Produktbereich MOS-ICS.
CORRELATING AND ADAPTIVE DIGITAL FILTERS Final Report, Jan. 1984
Norbert Bergs, Thorwald Rabeler, Juergen Ruprecht, Bernd Schendel, and Wolfgang Weltersbach Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 160 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-299; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32.50

Correlating and adaptive digital filters were developed for synchronization circuits and control loops. Digital phase locked loops were investigated for use as clock generator circuits in a digital TV-decoder. The basic circuit components are realized in NMOS-VLSI technology. The components are arranged as a software-oriented control circuit. Computer aided design programs for the simulation of nonlinear digital control systems and digital filters were developed. Author (ESA)

N85-25745# Valvo Roehren- und Halbleiterwerke der Philips G.m.b.H., Hamburg (West Germany). Produktbereich MOS-ICS.
DEVELOPMENT OF AN INTEGRATED CONTROL UNIT FOR THE PDV BUS CONCEPT Final Report, Mar. 1984
Rolf Becker Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 63 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-300; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13.50

The layout development of an NMOS-chip in 3.5 micrometer technology is presented. Cell designs and computer aided design (CAD) tools were used. Special-purpose cells and blocks are created. The CAD methods are described. The concept for a test-friendly circuit design is explained. Author (ESA)

N85-25746# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
18 Apr. 1985 127 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-011) Avail: NTIS HC A07/MF A01

Information on a wide variety of scientific and technological matters is presented. Topics include: national developments, applied sciences, environmental quality, chemistry, electronics, geophysics, mathematics, mechanics, medicine and psychiatry. For individual titles, see N85-25747 through N85-25749.

N85-25747# Joint Publications Research Service, Arlington, Va.
ON COUPLING FACTORS OF EXPLOSION **c34**
Zhang Shaoquan *In its* China Rept: Sci. and Technol. (JPRS-CST-85-011) 18 Apr. 1985 p 23-37 Transl. into EnGLISH from Diqiu Wuli Xuebao (Beijing, China), v. 27, no. 6, Nov. 1984 p 537-547 (For primary document see N85-25746 15-33)
Avail: NTIS HC A07/MF A01

The question of the seismic effect of an explosion plays an important part in the theory and practice of demolition engineering, antiseismic engineering, nuclear explosion engineering, seismic exploration, and seismic depth sounding. A still unresolved issue in this regard is concerned with the calculation of energy conversion process. An attempt is made to explore this issue by drawing on the research done in the field of seismic depth sounding. G.L.C.

N85-25748# Joint Publications Research Service, Arlington, Va.
IMPROVED GONDA'S CIRCUIT DESCRIBED
Li Changhou and Li Peihong *In its* China Rept: Sci. and Technol. (JPRS-CST-85-011) 18 Apr. 1985 p 38-43 refs Transl. into ENGLISH from Dianzi Kexue Jishu (Beijing, China), no. 10, 10 Oct. 1984 p 16 and 24-25 (For primary document see N85-25746 15-33)
Avail: NTIS HC A07/MF A01

In 1977, Japanese researchers Gonda, et al. presented a new high-voltage power supply circuit for use in photomultiplier tubes (PMT) which attracted quite a bit of public attention. Some persons in China developed a PMT high-voltage power supply based on Gonda's presentation. However, the output voltage of the Gonda circuit can only reach around 1000 V, but most of the PMT mode in China and abroad require a power supply voltage greater than 1000 V, and many require more than 1500 V. A PM-2 high-voltage power supply which improves the Gonda circuit while preserving its superior features was designed. G.L.C.

N85-25749# Joint Publications Research Service, Arlington, Va.
USING A SINGLE-BOARD COMPUTER TO MAINTAIN CONSTANT VOLTAGE, CURRENT SOURCES
Li Zigang and Yang Yongzhi *In its* China Rept: Sci. and Technol. (JPRS-CST-85-011) 18 Apr. 1985 p 44-49 Transl. into ENGLISH from Dianzi Kexue Jishu, no. 10, 10 Oct. 1984 p 13 and 26-27 (For primary document see N85-25746 15-33)
Avail: NTIS HC A07/MF A01

Constant voltage sources and constant current sources, especially high voltage power supplies going from several tens of thousands of volts to several hundreds of thousands of volts, in some special equipment or special situations, when increasing power, require rising slowly from zero to a predetermined voltage or current and then stabilizing at that point. When load changes or input voltage waves cause deviations in the predetermined value of the output voltage, it should be able to restore the predetermined value rapidly. When the task is over, it must slowly decline to zero. These processes are adjusted by manually turning a potentiometer which wastes time and is not very precise. To resolve these problems, a single-board computer to control constant voltage and constant current courses, was tested and proved feasible. The closed-loop control can play a clear role on rapid regulation, maintenance precision, and stability of the power supply. G.L.C.

N85-25750# New South Wales Univ., Kensington (Australia). School of Electrical Engineering and Computer Science.
DETECTION AND LOCATION OF PARTIAL DISCHARGES IN TRANSFORMER WINDINGS USING ELECTRICAL METHODS M.S. Thesis. Abstract Only
Patrick John Mcmullan Nov. 1983 3 p
Avail: NTIS HC A02/MF A01

With the increase in power ratings of modern high voltage transformers has come a corresponding interest in the value of partial discharge testing for quality control, design of HV equipment and fault diagnosis. A critical limitation on the development of electrical methods for the location of partial discharges (PD's) in large transformer windings has been the difficulty of predetermining the changes at transformer terminals due to known disturbances at unique positions within the unit. A particular location and calibration method which is thought to be an improvement on existing techniques is discussed. The new technique is a built-in calibration system having a controlled source of live partial discharges which may be moved up and down the windings under test. The system is intrinsically safe as all the components are insulating materials. G.L.C.

N85-25195# Joint Publications Research Service, Arlington, Va.
LEAD SHORTAGE HASTENS NEED FOR IMPROVED STORAGE BATTERIES

Only
V. M. Tarasov and S. I. Brygin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 6-7 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Radioelekton. (Kiev), v. 27, no. 10, Oct. 1984 p 89-90 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25581# Joint Publications Research Service, Arlington, Va.
TRANSIENT PROCESSES IN TUNED AMPLIFIER DURING PHASE-SHIFT KEYING WITH SMOOTH PHASE VARIATION Abstract Only
N. A. Kamalyayev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 14 refs Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 11, Nov. 1984 p 50-53 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25588# Joint Publications Research Service, Arlington, Va.
EVALUATION OF ADEQUACY PF JP54 PROTECTION LEVEL FOR LARGE ELECTRIC MACHINES Abstract Only
L. A. Zbarskiy, B. Ye. Teplitskiy, and Yu. V. Porshnev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 53 Transl. into ENGLISH from Promyshlennaya Energetika (Moscow), no. 10, Oct. 1984 p 23-25 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25589# Joint Publications Research Service, Arlington, Va.
METHOD OF IMPROVING DYNAMIC CHARACTERISTICS OF DC VOLTAGE STABILIZERS WITH COMPOUND REGULATION Abstract Only
G. S. Stoyanov and L. F. Zakharov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 54 refs Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 8, Aug. 1984 p 52-53 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25590# Joint Publications Research Service, Arlington, Va.
QUALITY CONTROL OF RADIOELECTRONIC APPARATUS COMPONENTS ON BASIS OF EXTERNAL CHARACTERISTICS IN FREQUENCY DOMAIN Abstract Only
F. N. Pokrovskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 55 refs Transl. into ENGLISH from Izv. Vyssh. Zaved., Radioelektron. (Kiev), v. 27, no. 10, Oct. 1984 p 92-95 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25591# Joint Publications Research Service, Arlington, Va.
CASCODE AND DIFFERENTIAL AMPLIFIER USING FIELD-EFFECT TRANSISTORS Abstract Only
N. Polyakov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 55-56 refs Transl. into ENGLISH from Radio (Moscow), no. 11, Nov. 1984 p 28-29 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25594# Joint Publications Research Service, Arlington, Va.
COMPUTER-AIDED IDENTIFICATION OF COMPLETE CONSTITUTION MODEL OF TRANSISTOR STRUCTURE FOR DESIGN OF SUBNANOSECOND LARGE-SCALE-INTEGRATED CIRCUITS Abstract Only
A. N. Bubennikov and A. D. Sadovnikov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 59 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Moscow), v. 27, no. 10, 15 Feb. 1984 p 46-51 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25597# Joint Publications Research Service, Arlington, Va.
DEVELOPMENTS IN MICROELECTRONICS: PAST AND FUTURE
Li Zhijian *In* China Rept.: Sci. and Technol. (JPRS-CST-85-009) 9 Apr. 1985 p 62-66 Transl. into ENGLISH from Dianzi Xuebao (Beijing), no. 5, Sep. 1984 p 61-65 (For primary document see N85-25596 15-31)
Avail: NTIS HC A08/MF A01

N85-25598# Joint Publications Research Service, Arlington, Va.
FUTURE PROSPECTS OF CHINA'S MICROWAVE SEMICONDUCTOR TECHNOLOGY
Han Jihong *In* China Rept.: Sci. and Technol. (JPRS-CST-85-009) 9 Apr. 1985 p 67-70 refs Transl. into ENGLISH from Dianzi Xuebao (Beijing), no. 5, Sep. 1984 p 86-92 (For primary document see N85-25596 15-31)
Avail: NTIS HC A08/MF A01

N85-25603# Joint Publications Research Service, Arlington, Va.
STATUS OF FRENCH RESEARCH IN PLASTIC BATTERIES
Philippe Douroux *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-007) 21 Feb. 1984 p 10-11 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 15 Dec. 1983 p 11 (For primary document see N85-25600 15-31)
Avail: NTIS HC A03/MF A01

N85-25615# Joint Publications Research Service, Arlington, Va.
NICKEL-IRON BATTERY TO BE USED IN PEUGEOT ELECTRIC CAR
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-027) 17 Aug. 1984 p 16-17 Transl. into ENGLISH from Le Monde (Paris), 1 Jun. 1984 p 18 (For primary document see N85-25612 15-31)
Avail: NTIS HC A04/MF A01

N85-25622# Joint Publications Research Service, Arlington, Va.
MICROPROCESSOR CONTROLLED STORAGE SAMPLING OSCILLOSCOPE
Zhang Guangming and Chen Yaochi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-007) 15 Mar. 1985 p 27-30 refs Transl. into ENGLISH from Jisuanji Yanjiu Yu Fazhan (Beijing, China), no. 1, 1984 p 50-51 (For primary document see N85-25621 15-31)
Avail: NTIS HC A08/MF A01

N85-25627# Joint Publications Research Service, Arlington, Va.
ASPECTS OF CSSR CMOS INTEGRATED CIRCUITS DISCUSSED
Jaroslav Kruml *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 9-21 refs Transl. into ENGLISH from Sdelovaci Technika (Prague), no. 10, 1983 p 365-368 (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

N85-25628# Joint Publications Research Service, Arlington, Va.
RECENT DEVELOPMENTS
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 21-22 Transl. into ENGLISH from Sdelovaci Technika (Prague), no. 10, 1983 p 368 (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

N85-25629# Joint Publications Research Service, Arlington, Va.
MHB4046 PHASE-LOCK CIRCUIT
Miroslav Jezek *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 22-27 ref Transl. into ENGLISH from Sdelovaci Technika (Prague), no. 10, 1983 p 369-370 (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

N85-25630# Joint Publications Research Service, Arlington, Va.
IMPROVED, CHEAPER SIPMOS CIRCUITS NO. 10, 1983 P 370
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 27-28 ref Transl. into ENGLISH from Sdelovaci Technika (Prague), (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

N85-25631# Joint Publications Research Service, Arlington, Va.
PHASE-LOCKED LOOP DESIGN WITH MHB4046

M. Karpunin and V. V. Bogorodskiy *In its* USSR Rept.: Transportation (JPRS-UTR-84-015) 31 May 1984 p 10-14 Transl. into ENGLISH from Mater.-Tekh. Snabzheniye (Moscow), no. 1, Jan. 1984 p 21-23 (For primary document see N85-25192 15-01)
Avail: NTIS HC A03

N85-25573# Joint Publications Research Service, Arlington, Va.
SYSTEM OF PHASE-LOCK AUTOMATIC FREQUENCY CONTROL WITH ACOUSTOELECTRONIC CONVOLVER Abstract
Pavel Hasan *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 29-36 refs Transl. into ENGLISH from Sdelovaci Technika (Prague), no. 10, 1983 p 371-373 (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

N85-25632# Joint Publications Research Service, Arlington, Va.
ADDITIONAL PLL DESIGNS
Vladimir Vachala *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-016) 24 May 1985 p 37-49 refs Transl. into ENGLISH from Sdelovaci Technika (Prague), no. 10, 1983 p 375-378 (For primary document see N85-25624 15-31)
Avail: NTIS HC A04/MF A01

N85-25660# Joint Publications Research Service, Arlington, Va.
CaD SYSTEMS FOR ELECTRONIC COMPONENT DESIGN REVIEWED
Siegfried Pilz *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 33-53 refs Transl. into ENGLISH from Messen Steuern Regeln (East Berlin), v. 27, no. 10, 1984 p 439-446 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

N85-25666# Joint Publications Research Service, Arlington, Va.
NEW DESIGNS FROM ELECTRONICS R AND D CENTER
Wladyslaw Wielich *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 93-100 Transl. into ENGLISH from Pomiary Automatyka Kontrola (Warsaw), no. 12, Dec. 1984 p 375-377 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

N85-26313# Joint Publications Research Service, Arlington, Va.
RADAR MEASUREMENT OF THICKNESS OF DRIFTING OCEAN ICE EMPLOYING CEPSTRAL SIGNAL PROCESSING Abstract Only
V. V. Bogorodskiy, V. I. Boyarskiy, and A. G. Oganesyan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 56 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 7, Jul. 1984 p 1404-1406 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N85-25751 Lehigh Univ., Bethlehem, Pa.
AN EXPERIMENTAL STUDY OF HAIRPIN-TYPE VORTICES AS A POTENTIAL FLOW STRUCTURE OF TURBULENT BOUNDARY LAYERS Ph.D. Thesis
Muvaffak Sabri Acarlar 1984 373 p
Avail: Univ. Microfilms Order No. DA8429401

It has been shown in numerous studies that the dominant identifiable structures in near wall region of turbulent boundary layers in the low speed streak are of particular importance since they are the apparent site of the near wall bursting activity which is the primary source of turbulence production in the boundary layer. A water channel study has been done to examine the suggestion that horseshoe or hairpin vortices exist in the near wall region of turbulent boundary layers and play a key role in the formation, persistence and breakdown of the low speed streaks. The hairpin vortices were synthetically generated by the interaction of both a hemisphere protuberance and a low speed fluid region (created by fluid injection techniques) with a developing laminar boundary layer. Under proper conditions, hairpin vortices shed extremely periodically which allows detailed examination of their behavior. Dissert. Abstr.

N85-25752 British Library Lending Div., Boston Spa (England).
INVESTIGATION OF INTERNAL FRICTION OF FREE-FLOWING MATERIAL DURING DISCHARGE
E. V. Maksimov, B. S. Fialkov, M. K. Alzhanov, and N. V. Shenberger 27 Feb. 1985 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), no. 8, 1984 p 43-46 (BLL-M-36141-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

The influence of internal friction on the discharge of a free-flowing materials by gravity through an opening or in an equivalent situation is considered with particular reference to the behavior in the dynamically unstable arch then formed above the opening. It is shown that the friction forces between particles are determined mainly by the dimensions of the particles, the state of their surface and their position on the dynamically unstable arch. An analytical relation is obtained for the magnitude of the friction force between particles. Author

N85-25753 Stanford Univ., Calif.
HEAT TRANSFER AND FLUID MECHANICS MEASUREMENTS IN THE TURBULENT REATTACHING FLOW BEHIND A BACKWARD-FACING STEP Ph.D. Thesis
John Charles Vogel 1984 206 p
Avail: Univ. Microfilms Order No. DA8429564

Stanton number profiles show a peak in the heat transfer rate about 2/3 of a step height upstream of reattachment. The heat transfer rate does not behave like the mean skin friction, but shows a strong correlation with the level of the fluctuating skin friction. Power law correlations of the maximum Stanton number show dependence on the step height Reynolds number to the -0.4 power and the bounday layer thickness at separation to the -0.1. For a constant wall heat flux, the redeveloping thermal boundary layer has its effective origin two step heights downstream of reattachment. Downstream of reattachment the thermal boundary layer resembles an unheated starting length flat-plate boundary layer. The near-wall region controls the heat transfer rate throughout the flow. The heat transfer rate is seen to be a function of the thickness of the laminar layer, which thins in the reattachement region to less than 1/4 that under the redeveloping boundary layer. The flow near the wall under the recirculation bubble is a laminar-like flow with high levels of unsteadiness. Dissert. Abstr.

N85-25754 Virginia Polytechnic inst. and State Univ., Blacksburg.
A FINITE ELEMENT, NAVIER-STOKES STUDY OF THE CONFINED, LAMINAR FLOW OVER A DOWNSTREAM FACING STEP Ph.D. Thesis
Phillip Andrew Treventi 1984 184 p
Avail: Univ. Microfilms Order No. DA8500918

The two-dimensional, confined, laminar flow over a downstream facing step was studied using a finite element, Navier-Stokes equation solver. The weak form of the stationary, incompressible Navier-Stokes equations in primitive varible form was obtained using the conventional Galerkin technique for mixed problems. Biquadratic Lagrange interpolating polynomials were used to construct the basis functions that generated the finite-dimensional subspace containing the approximate solutions to the velocity field, while the pressure was represented by a discontinuous, piecewise-linear approximation. This particular combination of solution subspaces was previously shown in a mathematically rigorous fashion to yield stable, consistent solutions to the Navier-Stokes equations. The results of the computations were benchmarked against the experimental data of others who utilized alternative,

unconventional formulations. With the proper choice of basis functions, a conventional Galerkin scheme can yield results that are in as good and in many cases better agreement with the available experimental data than those of unconventional schemes that rely upon an infusion of artificial dissipation to enhance their numerical stability. Dissert. Abstr.

N85-25755 Houston Univ., Tex.
AN EXPERIMENTAL INVESTIGATION OF UNEXCITED AND EXICTED ELLIPTIC JETS Ph.D. Thesis
Hyder Shahabuddin Husain 1984 198 p
Avail: Univ. Microfilms Order No. DA8428115

The turbulence characteristics of moderate aspect-ratio (2:1 and 4:1) elliptic jets were studied via hot-wire anemometer field measurements and flow-visualization. The investigations were carried out for laminar and turbulent boundary layers at the jet exit. It is found that the locations and number of switchovers of axes of the elliptic jet cross-section are strong functions of the initial condition and the aspect ratio. These two can also be altered via controlled excitation depending on the excitation Strouhal number. It is found that in the presence of large variations in exit momentum thickness along the nozzle perimeter, the momentum thickness in the minor-axis side controls the natural instability of the elliptic shear layer. Coherent structures in elliptic jets are characterized by the preferred-mode and the stable pairing mode. The respective Strouhal numbers associated with these two modes scale with the equivalent diameter of the jet. Based on D(3) the preferred code and stable pairing mode Strouhal numbers are found to be 0.4 and 0.85 respectively--the same values also found previously for circular jets hot-wire measurements, and the structure properties (phase-average velocities, coherent vorticity, incoherent turbulence intensities, coherent and incoherent Reynolds stresses, coherent production, etc.) are studied.
Dissert. Abstr.

N85-25756*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NUMERICAL SIMULATION OF BOUNDARY LAYER EXCITATION BY SURFACE HEATING/COOLING Final Report
Alvin Bayliss (Exxon Corporate Research Sciences Labs.), Lucio Maestrello, Paresh Parikh (Vigyan Research Associates, Inc.), and Eli Turkel (Tel-Aviv Univ.) Mar. 1985 24 p refs Submitted for publication
(Contracts NAS1-16394; NAS1-17070; NAS1-17130)
(NASA-CR-172575; ICASE-85-23; NAS 1.26:172575) Avail: NTIS HC A02/MF A01 CSCL 20D

The concept of active control of growing disturbances in an unstable compressible flow by using time periodic, localized surface heating is studied numerically. The simulations are calculated by a fourth-order accurate solution of the compressible, laminar Navier-Stokes equations. Fourth-order accuracy is particularly important for this problem because the solution must be computed over many wavelengths. The numerical results demonstrate the growth of an initially small fluctuation into the nonlinear regime where a local breakdown into smaller scale disturbances can be observed. It is shown that periodic surface heating over a small strip can reduce the level of the fluctuation provided that the phase of the heating current is properly chosen. Author

N85-25757*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A CRITICAL EVALUATION OF VARIOUS TURBULENCE MODELS AS APPLIED TO INTERNAL FLUID FLOWS
M. Nallasamy May 1985 72 p refs
(NASA-TP-2474; NAS 1.60:2474) Avail: NTIS HC A04/MF A01 CSCL 20D

Models employed in the computation of turbulent flows are described and their application to internal flows is evaluated by examining the predictions of various turbulence models in selected flow configurations. The main conclusions are: (1) the k-epsilon model is used in a majority of all the two-dimensional flow calculations reported in the literature; (2) modified forms of the k-epsilon model improve the performance for flows with streamline curvature and heat transfer; (3) for flows with swirl, the k-epsilon model performs rather poorly; the algebraic stress model performs better in this case; and (4) for flows with regions of secondary flow (noncircular duct flows), the algebraic stress model performs fairly well for fully developed flow, for developing flow, the algebraic stress model performance is not good; a Reynolds stress model should be used. False diffusion and inlet boundary conditions are discussed. Countergradient transport and its implications in turbulence modeling is mentioned. Two examples of recirculating flow predictions obtained using PHOENICS code are discussed. The vortex method, large eddy simulation (modeling of subgrid scale Reynolds stresses), and direct simulation, are considered. Some recommendations for improving the model performance are made. The need for detailed experimental data in flows with strong curvature is emphasized. A.R.H.

N85-25758# National Aerospace Lab., Tokyo (Japan).
STABILITY CALCULATIONS OF THE TWO-DIMENSIONAL BOUNDARY LAYER ALONG A CONCAVE WALL: PART 1: A NUMERICAL METHOD OF SOLUTION FOR THE SIMULTANEOUS ORDINARY DIFFERENTIAL EQUATIONS GOVERNING DISTURBANCES
Tadaharu Watanuki and Nobutake Itoh 1984 17 p refs
(NAL-TR-841; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Linear and weakly non-linear developments of Goertler vortices induced by instability of the boundary layer along a concave wall are governed by simultaneous ordinary differential equations of second and fourth order. The eigenvalue problems in linear analysis are posed by homogeneous equations and boundary conditions, but in weakly non-linear theories several boundary-value problems of inhomogeneous equations have to be solved, some of which are singular in the sense that there exist solutions only if the forcing terms satisfy a kind of solvability condition. A numerical method of solution is presented for three kinds of such equation systems and is shown to give very accurate solutions. Also, a very fast method of iteration appropriate for calculation of eigenvalues is given. Tentative calculations are made to obtain the neutral stability curve of the Blasius velocity profile to Goertler vortices as well as the maximum-growth-rate curve, the former of which is in very good agreement with the most reliable result of earlier investigations. Author

N85-25759# National Aerospace Lab., Tokyo (Japan).
AN EXPERIMENTAL STUDY OF AERODYNAMIC DAMPING CHARACTERISTICS OF A COMPRESSOR ANNULAR CASCADE IN HIGH SPEED FLOW AND THE VISUALIZATION OF ANNULAR CASCADE FLOW
Hiroshi Kobayashi 1984 21 p refs In JAPANESE; ENGLISH summary
(NAL-TR-838; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

To clarify experimentally the characteristics of aerodynamic damping of a compressor cascade in high speed flow, which is an important factor of blade oscillatory fatigue, the time-variant aerodynamic pressure acting on the blade surface of harmonically oscillated annular cascade in torsional mode was measured with a Freon gas annular cascade test facility over a range from high subsonic to supersonic and over a wide range of reduced frequencies. Through these data, the variance of cascade aerodynamic stability of inlet flow Mach No. and reduced frequency, and the effects of shock wave movement due to blade oscillation on an unsteady aerodynamic force and on an aerodynamic stability of the cascade were made clear. The visualization of annular cascade flow by the new schlieren system is also described.
Author

N85-25760*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE INFLUENCE OF JET-GRID TURBULENCE ON HEAT TRANSFER FROM THE STAGNATION REGION OF A CYLINDER IN CROSSFLOW
James E. OBrien (Pennsylvania State Univ., University Park) and G. James VanFossen, Jr. 1985 13 p refs Proposed for presentation at the Natl. Heat Transfer Conf., Denver, 4-7 Aug.

1985; sponsored by ASME
(NASA-TM-87011; E-2555; NAS 1.15:87011) Avail: NTIS HC A02/MF A01 CSCL 20D

The effect of high-intensity turbulence on heat transfer from the stagnation region of a circular cylinder in crossflow was studied. The work was motivated by the desire to be able to more fully understand and predict the heat transfer to the leading edge of a turbine airfoil. In order to achieve high levels of turbulence with a reasonable degree of isotropy and homogeneity, a jet-injection turbulence grid was used. The jet grid provided turbulence intensities of 10 to 12 percent, measured at the test cylinder location, for downstream blowing with the blowing rate adjusted to an optimal value for flow uniformity. Heat transfer augmentation above the zeroturbulence case ranged from 37 to 53 percent for the test cylinder behind the jet grid for a cylinder Reynolds number range of 48,000 to 180,000, respectively. The level of heat transfer augmentation was found to be fairly uniform with respect to circumferential distance from the stagnation line. Stagnation point heat transfer results (expressed in terms of the Frossling number) were found to be somewhat low with respect to previous studies, when compared on the basis of equal values of the parameter Tu Re(1/2), indicating an additional Reynolds number effect as observed by previous investigators. Consequently, for a specified value of Tu Re(1/2), data obtained with a relatively high turbulence intensity will have a lower value of the Frossling number. M.G.

N85-25761*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLOW THROUGH VERY POROUS INCLINED SCREENS
Kenneth K. Muramoto and Paul A. Durbin 1985 10 p refs Proposed for presentation at the 18th Fluid Dyn. and Plasmadyn. and Lasers Conf., Cincinnati, 16-18 Jul. 1985; sponsored by AIAA
(NASA-TM-86979; E-2517; NAS 1.15:86979) Avail: NTIS HC A02/MF A01 CSCL 20D

The steady, inviscid flow through and around a screen inclined at a uniform angle to the incoming flow was investigated. For a screen placed in an infinite flow field, an asymptotic analysis for small resistance coefficients was performed, and the effects of inclination were determined. The velocity at first order in the asymptotic expansion was nonuniform along the screen. This nonuniformity caused the wake behind the screen to contain distributed vorticity at second order. These effects therefore occurred at one order lower than for normal screens. M.G.

N85-25762*# National Aeronautics and Space Administration, Washington, D. C.
CHARACTERISTICS OF HEAT EXCHANGE IN THE REGION OF INJECTION INTO A SUPERSONIC HIGH-TEMPERATURE FLOW
F. G. Bakirov and Z. G. Shaykhutdinov Apr. 1985 14 p refs Transl. into ENGLISH from Inzh.-Fiz. Zh. (USSR), v. 24, no. 5, May 1973 p 790-797 Original language document was announced in IAA as A73-34772 Transl. by Scientific Translation Service, Santa Barbara, Calif
(Contract NASw-4004)
(NASA-TM-77833; NAS 1.15:77833) Avail: NTIS HC A02/MF A01 CSCL 20D

An experimental investigation of the local heat transfer coefficient distribution during gas injection into the supersonic-flow portion of a Laval nozzle is discussed. The controlling dimensionless parameters of the investigated process are presented in terms of a generalized relation for the maximum value of the heat transfer coefficient in the nozzle cross section behind the injection hole. Data on the heat transfer coefficient variation along the nozzle length as a function of gas injection rate are also presented, along with the heat transfer coefficient distribution over a cross section of the nozzle. R.J.F.

N85-25763# New South Wales Univ., Kensington (Australia). School of Mechanical and Industrial Engineering.
NATURAL CONVECTION IN CYLINDRICAL CONTAINERS Ph.D. Thesis. Abstract Only
See Seng Leong 1983 3 p
Avail: NTIS HC A02/MF A01

A numerical method has been developed using alternating direction implicit and Fourier series to solve the finite difference approximations to the equations governing natural convection in a cylinder. The accuracy of the numerical method is investigated by comparing the results with experimental results and an analytical solution. It is shown that the method accurately predicts the flow and temperature distributions within the cavity. Two-dimensional natural convection solutions in a horizontal cylinder have been obtained for Rayleigh numbers up to 10 to the 6th power and Prandtl numbers in the range 0.2 to 10 to the 5th power. There is little difference in the motion of the fluid and heat transfer for Prandtl numbers in the range 7.0 and 10 to the 5th power except in the locations of the secondary rolls. The effect on the flow and heat transfer is also studied when heating is applied from different directions. B.W.

N85-25764# Tennessee Univ., Knoxville.
AN EXPERIMENTAL INVESTIGATION OF CONFINED, MULTIPLE, TURBULENT JET MIXING WITH RECIRCULATION Ph.D. Thesis
Ashoke Ghosh Dec. 1984 222 p refs
(Contract DE-AC02-79ET-10815)
Avail: NTIS HC A10/MF A01

An axisymmetric duct that simulated a combustor configuration, was used to examine the flow fields in combustors that utilize injector plates to establish turbulent jet mixing of fuels and oxidizers. Five different injector plates were tested. Flow fields downstream of the plates were investigated using flow visualization and laser velocimetry. Qualitative data for flows created by rings of discrete jets were obtained with dye injection and hydrogen bubble generation flow visualization techniques. Wall static pressure distributions were measured with a sensitive pressure transducer. The velocity and turbulence fields were quantified using a Bragg-diffracted, two-component laser doppler velocimeter (LV). The locations and extents of recirculation zones and jet expansion rates were deduced from the LV data. Results show that the flow due to an annular jet is two dimensional, but those due to discrete jets are fully three dimensional. A.R.H.

N85-25765# Florida Univ., Gainesville. Dept. of Mathematics.
[RESULTS FOR SECOND ORDER HYPERBOLIC SYSTEMS WITH VISCOUS DUMPING] Progress Report, 1 Sep. - 31 Dec. 1984
I. Lasiecka Jan. 1985 3 p
(Grant AF-AFOSR-0365-84)
(AD-A151100; AFOSR-85-0172TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Results have been obtained for certain second order hyperbolic systems with viscous dumping which imply that one can increase at will the margin of stability of arbitrarily finite modes of the damped wave equation (those presumed dominant) by means of certain type of the boundary feedback, while the remaining new modes approach asymptotically the original ones from the left of the vertical axis Rez = -k. Numerical testing of the constructive procedure is in the process of being implemented by a Ph.D. student. Author (GRA)

N85-25766# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.
APPLICATION OF ADAPTIVE GRIDS IN SOLVING THE PARTIAL DIFFERENTIAL EQUATIONS GOVERNING FLUID FLOW Final Report, 1 May 1983 - 31 Jul. 1984
D. A. Anderson and R. G. Hindman Sep. 1984 60 p
(Grant AF-AFOSR-0167-83)
(AD-A151175; ISU-ERI-AMES-85412; AFOSR-85-0186TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

A brief review of the goals and progress of the research on adaptive grid generation is presented. The principal results of the research are given by four papers supported by Grant AFOSR-83-0167 which comprise the appendix: Adaptive Grid Methods for Partial Differential Equations from Advances on Grid Generation, and AIAA papers 84-1608, 84-1610, and 84-1668. GRA

N85-25767# Nielsen Engineering and Research, Inc., Mountain View, Calif.
COMPUTATIONAL MODELS OF THE VISCOUS SUBLAYER AND LIMITING BEHAVIOR OF TURBULENCE NEAR A WALL Final Report, 15 Jul. 1982 - 30 Sep. 1984
D. R. Chapman and G. D. Kuhn Dec. 1984 74 p
(Contract N00014-82-C-0672)
(AD-A151198; NEAR-TR-334) Avail: NTIS HC A04/MF A01 CSCL 20/4

Three computational models of incompressible viscous sublayer turbulence have been developed using the time-dependent Navier-Stokes equations with prescribed velocity boundary conditions at the outer edge of the sublayer. The models attempt in different ways to simulate the highly elongate, quasiperiodic, coherent structures observed experimentally. Comparison of computed results with experiment is good for mean streamwise velocity, mean Reynolds stress, and correlation coefficient; and reasonably good for the three turbulence intensities, skewness and flatness of streamwise velocity and of Reynolds stress. Within a thin layer adjacent to the outer edge, all three models yield anomalously high values for dissipation and streamwise vorticity intensity. Computations using a fine mesh establish the limiting behavior of turbulence quantities vary near a wall. Below about 0.3 wall units, the variations with distance from the wall were found to be: linear for streamwise turbulence, spanwise turbulence, and departure of dissipation and streamwise vorticity from their wall values; second power for turbulence normal to the wall; third power for Reynolds stress; and a constant nonzero value for the correlation coefficient. GRA

N85-25768# Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
MODIFICATIONS TO A PROPAGATION MODEL FOR THE COMBINDED REFRACTION-DIFFRACTION OF STOKES WAVES; SHALLOW WATER, LARGE ANGLE AND BREAKING WAVE EFFECTS
J. T. Kirby and R. A. Dalrymple Jan. 1985 91 p
(Contract N00014-84-C-0188)
(AD-A151428; UFL/COEL-85/001) Avail: NTIS HC A05/MF A01 CSCL 20/4

This report discusses several features of the combined refraction-diffraction model for Stokes waves (developed by Kirby, 1983) which limit its applicability in shallow water. Chapter 2 discusses a proposed dispersion relation for waves in arbitrary water depth, which provides a smooth patch between the lowest order Stokes dispersion relation and an approximate dispersion relation for shallow water, given originally by Hedges (1976). Chapter 3 extends the large-angle approximation of Kirby (1983) to the case of waves on currents, in order to allow for the calculation of waves which are refracted or diffracted to angles which deviate significantly from an initially preferred direction of propagation, due to the combined effect of varying depth and current. Finally, Chapter 4 provides some calculations of wave fields around surface-piercing islands, in order to illustrate the effect of wave breaking and the use of a thin-film approximation for dry areas in the model. GRA

N85-25769# Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
WATER WAVE PROPAGATION OVER UNEVEN BOTTOMS
J. T. Kirby Jan. 1985 97 p
(Contract N00014-84-C-0188)
(AD-A151450; UFL/COEL-TR/055) Avail: NTIS HC A05/MF A01 CSCL 20/4

In Part I of this report, a time dependent form of the reduced wave equation of Berkhoff is developed for the case of water waves propagating over a bed consisting of ripples superimposed on an otherwise slowly varying mean depth which satisfies the mild slope assumption. The ripples are assumed to have wavelengths on the order of the surface wave length but amplitudes which scale as a small parameter along with the bottom slope. The theory is verified by showing that it reduces to the case of plane waves propagating over a non-dimensional, infinite patch of sinusoidal ripples, studied recently by Davis and Heathershaw and Mei. We then study two cases of interest--formulation and use of the coupled parabolic equations for propagation over patches of arbitrary form in order to study wave reflection, and propagation of trapped waves along an infinite ripple patch. In the second part, we use the results of Part 1 to extend the results for weakly-nonlinear wave propagation to the case of partial reflection from bottoms with mild-sloping mean depth with superposed small amplitude undulations. GRA

N85-25770# Puerto Rico Univ., Mayaguez.
MIXING ACROSS A GAS-GAS INTERFACE
W. Khan Dec. 1984 9 p
(Grant DAAG29-82-G-0005)
(AD-A151471; ARO-19201.3-EG) Avail: NTIS HC A02/MF A01 CSCL 20/4

An investigation of interfacial turbulence at gas-gas interfaces is reported. All interfaces cannot be treated in the same theoretical or experimental frame-work since the mathematics governing the motion of the different phases is different and the physical properties of gas and liquid phases are different, necessitating different experimental techniques. In this case also, with a gas-gas interface in turbulence motion we have free turbulence, as it is not being influenced by a solid boundary. Here, the rate of mixing of each gas with the other across the interface is important, an interface that is not necessarily clearly defined, but can assume any of three possibilities, spherical, cylindrical or planar at various positions of the interface as the containing, sobering and smoothing effect of surface tension no longer prevails or exists. The problem also resolves itself into various transport coefficients, microscopic and macroscopic depending on whether each phase is treated as a continuum or not and which depends on the kind of flow established sub-sonic, super-sonic or hyper-sonic, all of which depend on the value of the mach number, M = V/a. GRA

N85-25771# Naval Postgraduate School, Monterey, Calif.
AN EXPERIMENTAL TECHNIQUE FOR THE STUDY OF VELOCITY PROFILES IN A LAMINAR JET USING A PULSED NITROGEN LASER M.S. Thesis
D. T. Armstrong Sep. 1984 50 p
(AD-A151496) Avail: NTIS HC A03/MF A01 CSCL 20/4

This thesis investigated a nonintrusive technique for flow visualization of momentum jets. A flow system containing a fluid photosensitive to ultraviolet radiation (a solution of mineral spirits and photochromic dye) has been constructed for generating a momentum jet in a test chamber. An ultraviolet beam (337.1 nm) from a pulsed nitrogen gas laser was fired through the test chamber producing opaque traces in the jet and ambient fluid. Movement of the fluid deformed these traces and produced a record of fluid flow. Velocity distributions have been obtained in laminar jets. GRA

N85-25772# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN EXPLORATORY INVESTIGATION OF SHARP FIN-INDUCED SHOCK WAVE/TURBULENT BOUNDARY LAYER INTERACTIONS AT HIGH SHOCK STRENGTHS M.S. Thesis
S. P. Goodwin Nov. 1984 156 p
(AD-A151571; AD-E500700; AFIT/CI/NR-85-27T) Avail: NTIS HC A08/MF A01 CSCL 20/4

For this thesis an experimental investigation of sharp fin-induced shock/boundary layer interactions was carried out at a Mach number of 2.95, unit Reynolds numbers ranging from 1 to 4 million per inch, boundary layer thicknesses of 0.14 and 0.50 inches, and fin angles of attack between 12 and 22 degrees. Surface pressure and surface flow visualization data were collected. Results showed that high shock strength interactions were qualitatively similar to those at low shock strengths. When compared to two-dimensional test results, the present three-dimensional data were seen to have a similar dependence on Reynolds number but a different sort of dependence on shock strength. The data were also seen to possess conical similarity. As was the case at lower shock strengths, the interactions could be scaled using unit Reynolds number, boundary layer thickness, and normal Mach

number. The appearance of the feature termed secondary separation was noted to depend on boundary layer thickness. Competing feature and turbulence scales were hypothesized to produce this dependence. GRA

N85-25773# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
INVESTIGATION OF POTENTIAL AND VISCOUS FLOW EFFECTS CONTRIBUTING TO DYNAMIC STALL M.S. Thesis
A. J. S. Allaire Sep. 1984 88 p
(AD-A151696; AFIT/GAE/AA/84S-1) Avail: NTIS HC A05/MF A01 CSCL 20/4

This thesis explores the problem of dynamic stall, i.e., the stall of an airfoil undergoing pitching motion. General equations of continuity and momentum are developed for a non-inertial and unsteady control volume. They are written in momentum-integral form and the boundary layer on the pitching airfoil is computed using a modified von Karman-Pohlhausen method. The boundary layer edge velocity, velocity gradient and time rate of change of velocities required for the step by step integration of the von Karman-Pohlhausen working equations are obtained from the inviscid solution. The inviscid velocity profile along the surface of the airfoil is obtained by conformal mapping from the velocity profile around a rotating circular cylinder. Complex potential flow theory is used to obtain the velocity around the cylinder. The Kutta condition is continuously maintained at the point mapping to the trailing edge of the airfoil for each time step. This way, the flow is considered steady at each time step, but varies from one time step to the next when the angle of attack is increased. GRA

N85-25774# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
UNSTEADY NAVIER-STOKES CALCULATIONS IN AN ACCELERATED REFERENCE FRAME M.S. Thesis
T. E. Speer Dec. 1984 84 p
(AD-A151751; AFIT/GAE/ENY/84D-26) Avail: NTIS HC A05/MF A01 CSCL 20/4

The purpose of this project was to develop a numerical method capable of calculating the laminar flow about a two dimensional accelerating body using the incompressible Navier-Stokes equations. This problem arises in the calculation of the dynamic stall of an airfoil and in the calculation of pitching and heaving stability derivatives for an isolated airfoil. It is also a first step toward solving the three dimensional flow about a complete wing undergoing arbitrary motion at high angles of attack, including departure, spin, and post-stall maneuvers. Numerical calculations to date have not been satisfactory. Test cases presented are Stoke's first problem, a circular cylinder translating at a Reynolds number of 20, and a rotating stationary circular cylinder. GRA

N85-25775# Naval Postgraduate School, Monterey, Calif.
TURBULENCE EFFECTS ON A GLOW DISCHARGE AS DERIVED FROM CONTINUITY AND ENERGY CONSIDERATIONS M.S. Thesis
W. R. Oker Sep. 1984 99 p
(AD-A151838) Avail: NTIS HC A05/MF A01 CSCL 20/4

This thesis investigates the effects of a turbulent gas flow on the stability of a glow discharge. While it is known that turbulence affects the stability of glow discharges, the mechanism is not clear. Primarily, the problem lies in the very long characteristic times of turbulence phenomena when compared to the glow discharge instability times. A mathematical model is developed and solved numerically for the ambipolar diffusion and an overall energy equation in an unsteady, cylindrical coordinate system. Strong perturbations of the electric field are introduced which disturb an otherwise stable configuration and the effects of turbulence on the time evolution of the perturbation are observed. It is shown that modification of the ambipolar diffusion coefficient and thermal conductivity is a reasonably sufficient model to introduce the turbulence effects. It is found that the charged particle density is effectively the sole source of heating in the gaseous environment of the discharge. It is then shown that turbulence acts to suppress the temperature instability introduced by the discharge streamer. GRA

N85-25776# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
GASDYNAMIC EVALUATION OF CHOKING CASCADE TURNS M.S. Thesis
D. R. Perez Dec. 1984 79 p
(AD-A151854; AFIT/GAE/AA/84D-21) Avail: NTIS HC A05/MF A01 CSCL 20/4

Uses for ram air in airborne vehicles are increasing along with the need for sophisticated ducting of the compressed air. Inlets operating supercritically, a normal shock in the subsonic diffuser, and use an aerodynamic grid to control the normal shock position to a region of low total pressure losses are discussed. Turning of the flow requires long radius curves to maintain the total pressure. This study combines the internal shock positioning and flow turning into a flow choking cascade turn with a short radius. Several sets of 90 degree turning sections, for turning compressed air, were selected, designed, and tested gas dynamically. Two of the turn sections were totally subsonic and only turned the air flow. Two other sections turned and choked the flow during supercritical inlet operation. These flow controllers perform the same function as an aerodynamic grid and flow turning vanes used in current internal compressible airflow designs. These tests correlated the suitability of using a water table versus a gas dynamic apparatus for determining the flow control capabilities and pressure recovery of the cascades. The subsonic only turning section gave the best pressure recovery and total pressure distribution along the turning axis, but allowed the supercritical internal shock to move towards large shock/boundary layer interaction. The two shock positioning cascades provided good internal shock control with only slightly lower pressure recovery. Further investigation is needed for the effects of back pressure fluctuations on the flow dynamics. GRA

N85-25777# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
INFLUENCE OF SURFACE ROUGHNESS ON COMPRESSOR BLADES AT HIGH REYNOLDS NUMBER IN A TWO-DIMENSIONAL CASCADE M.S. Thesis
G. P. Moe Dec. 1984 113 p
(AD-A151855; AFIT/GAE/AA/84D-19) Avail: NTIS HC A06/MF A01 CSCL 20/4

A cascade test facility has been established which incorporates sidewall boundary layer control, permitting two-dimensional flow investigation over the center span (about 2/3 the width of the blade) of an airfoil in cascade, and an investigation has been conducted to determine the influence of roughness on the airfoil. Two representative compressor profiles, the NACA 64-A905 and 65-A506, with two inch chords and aspect ratios of one were tested at airflow inlet velocities comparable to those axial flow compressors. An Axial Velocity Density Ratio of unity was the criterion used to determine when two-dimensional flow was achieved. Test results indicate that initial small increases of roughness have a much greater effect on blade total pressure loss than do subsequent larger roughness values. A small increase in roughness produces a substantial increase in free stream turbulence with practically no effect on the wake. Further increase in roughness produces a substantial effect on the wake but little effect on the free stream turbulence. Surface roughness is shown to have a much greater influence on blade wake turbulence intensity for the higher camber airfoils tested than for lower camber airfoils. GRA

N85-25778# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
FLOW OVER A BICONIC CONFIGURATION WITH AN AFTERBODY COMPRESSION FLAP Final Report, Jan. - Apr. 1984
J. S. Shang and R. W. MacCormack Apr. 1984 49 p
(AD-A151882; AFWAL-TR-84-3059) Avail: NTIS HC A03/MF A01 CSCL 20/4

Three-dimensional Navier-Stokes solutions were obtained for flow over a biconic configuration with an afterbody compression

flap. The simulated flow was achieved for a Mach number of 7.97, a characteristics Reynolds number of 9.23 million and at a zero degree angle of attack. A comparison study was conducted using the vectorized MacCormack's explicit and implicit numerical schemes. Results from both the explicit and the implicit algorithms correctly yielded the detailed flow field structure and the heat transfer information in comparison with experimental data. However, the implicit numerical procedure exhibited a significant improvement in numerical efficiency over the explicit method. For fine mesh clustering near the solid body surface, necessary to resolve surface shear stress and heat transfer rates, the implicit scheme achieved an order of magnitude reduction in computing time. GRA

N85-25779# Aerotherm Acurex Corp., Mountain View, Calif.
VISCOUS EFFECTS ON BLAST WAVE FLOWFIELDS Final Report, 1 Jul. 1981 - 31 Aug. 1984
B. C. Bennett, M. J. Abbett, and C. J. Wolf Dec. 1984 48 p
(Contract DAAG29-81-C-0030)
(AD-A152013; FR-85-11/ATD; ARO-18104.1-EG) Avail: NTIS HC A03/MF A01 CSCL 20/4

The flow resulting from the interaction of a planar shock wave and an object on the ground was calculated with the full Navier-Stokes equations, including turbulence effects. The resulting flow fields show the development of regions of separation both before and aft of the structure, thus illustrating the importance of including turbulence and viscous effects in predicting the flow fields resulting from blast waves passing over structures. These results suffer from a need to use a coarse grid that can not adequately resolve the details of the boundary layer wall region. The use of a finer grid was not feasible due to the inordinately long computing times which would result, even to the CRAY X-MP computer. Test cases verified that implicit finite difference code, ARC2D, could accurately predict boundary layer phenomena and shock-object interaction given a sufficiently fine grid. Still the code does have its limitations and more effort is required to solve the quasi-steady flow over the structure on a wall (part of this effort would probably be an improved grid). GRA

N85-25780# Sandia Labs., Albuquerque, N. Mex.
MEASUREMENT OF MATERIAL PROPERTIES TO Mbar PRESSURES USING TIME-RESOLVED SHOCK WAVE TECHNIQUES
J. R. Asay Jan. 1985 45 p refs
(Contract DE-AC04-76DP-00789)
(DE85-007319; SAND-84-2657) Avail: NTIS HC A03/MF A01

Shock wave techniques provide a powerful tool for studying material properties at extremes of pressure and temperature difficult to achieve by other methods. The traditional shock wave experiment provides stress-volume information along a single path, the Hugoniot, on the equation of state surface. With the recent development of time resolved shock wave techniques, it is possible to determine equation of state information for a much broader range of P-V-T conditions off the Hugoniot, by making some assumptions about the stress and temperature states achieved in the shocked state. This paper discusses the recent developments in shock wave methods for achieving off Hugoniot material properties and present some recent results for unloading and reloading experiments from the shocked state and also isentropic compression measurements in aluminum. Finally, future directions for time resolved techniques and off Hugoniot measurements are presented. DOE

N85-25781# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.
APPLICATION OF THE VAN LEER METHOD TO THE SOLUTION OF ONE-DIMENSIONAL VOLUME FRACTION EQUATIONS
M. J. Andrews Oct. 1984 49 p refs
(CFD-84/17) Avail: NTIS HC A03/MF A01

A linear friction and a dynamic mix problem in two-phase flow were solved by the van Leer and a fully implicit method. The van Leer method was implemented as an attachment to the PHOENICS computer code. For the linear problem, the second order Van Leer method gives a significant reduction in numerical diffusion over a fully implicit upwind scheme, and a first order explicit method. The linear friction test problem is well suited to the Van Leer method as the analytical volume fraction profile is nearly linear. The dynamic problem shows that numerical diffusion may be reduced in problems where the volume fraction profile is not linear. The second order van Leer scheme is recommended for the solution of one-dimensional volume fraction equations.
Author (ESA)

N85-25782# European Space Agency, Paris (France).
PSEUDO-UNSTEADY SYSTEMS FOR STEADY INVISCID FLOWS
Henri Viviand Nov. 1984 97 p refs Transl. into ENGLISH of "Systemes Pseudo-Instationnaires pour les Ecoulements Stationnaires de Fluide Parfait" rept. ONERA-P-1983-4 ONERA, Paris, 1983 Original language document was announced as N84-25955 (ESA-TT-877; ONERA-P-1983-4) Avail: NTIS HC A05/MF A01

The first order partial differential equations of pseudo-unsteady type for the calculation of steady inviscid flows, compressible and isoenergetic, or incompressible, were studied. A family of such systems depending on five parameters is considered. The condition for a system to be hyperbolic with respect to time, and a condition relating to the number of eigenvalues of same given sign, are discussed as a function of these parameters. Examples of pseudo-unsteady systems are given, showing the very varied properties which these systems possess. There exist systems which are optimal with regard to an explicit numerical stability criterion. In flows which either are homentropic for a compressible fluid, or have uniform total pressure for an incompressible fluid, a two parameter family of simpler pseudo-unsteady systems is shown to exist. Author (ESA)

N85-25783# National Oceanic and Atmospheric Administration, Princeton, N.J. Geophysical Fluid Dynamics Lab.
GEOPHYSICAL FLUID DYNAMICS LABORATORY ACTIVITIES, FY84, PLANS, FY85
Oct. 1984 154 p refs
(PB85-147601) Avail: NTIS HC A08/MF A01 CSCL 14B

This document is intended to serve as a summary of the work accomplished at the Geophysical Fluid Dynamics Laboratory (GFDL) and to present a glimpse of the near future direction of its research plans. The overview covers the five major research areas that correspond to NOAA's mission in oceanography and meteorology: Weather Service; Climate; Atmospheric Quality; Marine Quality; Ocean Service. These are five of the NOAA categories (bins) for research activities. The body of the text describes goals, specific recent achievements and future plans for the following major research categories: Climate Dynamic; Middle Atmosphere Dynamics and Chemistry; Experimental Prediction; Oceanic Circulation; Planetary Circulations; Observational Studies; Hurricane Dynamics; Mesoscale Dynamics; and Convection and Turbulence. GRA

N85-25784# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
THREE-DIMENSIONAL BOUNDARY LAYERS
Loughton, England Feb. 1985 118 p refs Proc. of the Round Table Discussion on 3D Boundary Layers, Brussels, 24 May 1984 (AGARD-R-719; ISBN-92-835-1491-2) Avail: NTIS HC A06/MF A01

Progress in understanding three dimensional boundary layers is reported and guidance for future work in this field is provided. Turbulence modelling, which is unsatisfactory in 2-D flows, is even less suitable for three-dimensional boundary layers. More sophisticated models do not appear to work better in many cases than simple ones. The situation is even less satisfactory for separated flows where the validity of certain computations is in question. Lack of accurate, extensive data hampers efforts to comprehend important flow mechanisms and validate computational results. The paucity of high-quality experimental data is remarkable. For individual titles, see N85-25785 through N85-25789.

N85-25785# Centre d'Etudes et de Recherches, Toulouse (France). Dept. d'Aerothermodynamique.

THREE-DIMENSIONAL BOUNDARY LAYERS AND SHEAR FLOWS ACTIVITIES AT ONERA/CERT c24
R. Michel *In* AGARD Three-Dimensional Boundary Layers Feb. 1985 15 p refs (For primary document see N85-25784 15-34)
Avail: NTIS HC A06/MF A01

Experimental and theoretical research activities devoted to three-dimensional boundary layers and turbulent shear flows are reviewed. Emphasis is on (1) development, application and control studies of calculation methods for turbulent boundary layers and wakes; (2) corner flows; and (3) stability and transition in three-dimensional flows. Typical results are presented. A.R.H.

N85-25786# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.
THREE-DIMENSIONAL BOUNDARY LAYERS: A REPORT ON WORK IN GERMANY
H. Hornung *In* AGARD Three-Dimensional Boundary Layers Feb. 1985 22 p refs (For primary document see N85-25784 15-34)
Avail: NTIS HC A06/MF A01

The work of selected industrial, university and research establishment groups on three-dimensional boundary layers is summarized and presented as a guide to the quoted references in which details may be found. The approaches used include numerical techniques, experimental techniques, and data base experiments. A.R.H.

N85-25787# National Aerospace Lab., Amsterdam (Netherlands).
THREE-DIMENSIONAL BOUNDARY LAYER RESEARCH AT NLR
B. vandenBerg *In* AGARD Three-Dimensional Boundary Layers Feb. 1985 17 p refs (For primary document see N85-25784 15-34)
Avail: NTIS HC A06/MF A01

The experimental and theoretical research work on three-dimensional boundary layers, carried out at NLR between 1970 and 1984, or presently under development is reviewed. The development of a practical calculation method and its extension to compressible laminar and turbulent boundary layers on developable as well as nondevelopable surfaces is discussed. The main features of the improved method are: (1) an arbitrary non-orthogonal curvi-linear surface coordinate system can be chosen by the user; (2) the organization of the calculation method was designed with the emphasis on the users-oriented properties; (3) an efficient finite-difference method is employed for the whole boundary layer, including the wall layer; and (4) an algebraic eddy viscosity turbulence model is used, because the model is simple, while for boundary layer flows, no other current turbulence models do a significantly better job. A.R.H.

N85-25788# London Univ. (England). Dept. of Aeronautical Engineering.
BRIEF REVIEW OF CURRENT WORK IN THE UK ON THREE DIMENSIONAL BOUNDARY LAYERS
A. D. Young *In* AGARD Three-Dimensional Boundary Layers Feb. 1985 17 p refs (For primary document see N85-25784 15-34)
Avail: NTIS HC A06/MF A01

Work in progress in industry, the universities and the R.A.E is summarized. Areas of study include theoretical work on laminar boundary layers (flow round obstacles, outside streamwise corners, internal flows in turbo-machinery), transition effects on bodies at large angles of incidence associated with cross flow and leading edge contamination, experimental and theoretical work on turbulent boundary layers (swept wings with and without separation, curvature and cross flow, blunt trailing edges, wakes with large cross flow, flow outside streamwise corners, integral and finite difference prediction methods both direct and inverse). It is increasingly appreciated that more work is needed on the fundamental effects of cross flow on the dynamics of turbulence.Author

N85-25789# Douglas Aircraft Co., Inc., Long Beach, Calif. Fluid Mechanics and Heat Transfer Div.
PROBLEMS AND OPPORTUNITIES WITH THREE-DIMENSIONAL BOUNDARY LAYERS
Tuncer Cebeci *In* AGARD Three-Dimensional Boundary Layers Feb. 1985 35 p refs Sponsored by ONR, NSF and NASC Prepared in cooperation with California State Univ., Long Beach (For primary document see N85-25784 15-34)
Avail: NTIS HC A06/MF A01

Research activity concerned with three-dimensional boundary layers is reviewed. Emphasis is on the flows over the components of airplanes, missiles and ships. In each case, the objective is to develop understanding of the flow characteristics and of the influence of important parameters including geometry, Reynolds number and Mach number, and to make use of this understanding to improve design procedures. The choice of a coordinate system, criteria for selecting a turbulence model, solution and interaction procedures, and the nature of three-dimencional separation are considered. Computational and experimental research needed is indicated. A.R.H.

N85-25172*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TRENDS IN COMPUTATIONAL CAPABILITIES FOR FLUID DYNAMICS
Victor L. Peterson *In* AGARD Transonic Unsteady Aerodyn. and its Aeroelastic Appl. Jan. 1985 9 p refs Document previously announced as N84-33383 (For primary document see N85-25171 15-01)
Avail: NTIS HC A14/MF A01 CSCL 20D

N85-25747# Joint Publications Research Service, Arlington, Va.
ON COUPLING FACTORS OF EXPLOSION
Zhang Shaoquan *In its* China Rept: Sci. and Technol. (JPRS-CST-85-011) 18 Apr. 1985 p 23-37 Transl. into EnGLISH from Diqiu Wuli Xuebao (Beijing, China), v. 27, no. 6, Nov. 1984 p 537-547 (For primary document see N85-25746 15-33)
Avail: NTIS HC A07/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N85-25790 Atomic Energy Research Establishment, Harwell (England). Materials Physics and Metallurgy Div.
THE DEVELOPMENT OF A TRANSDUCER SYSTEM FOR THE ACCURATE MEASUREMENT OF ULTRASONIC PHASE DELAY OF SH PLATE WAVES
R. Langman (Tasmania Univ., Hobart, Australia) and D. R. Allen Feb. 1985 48 p refs
(AERE-R-11598; ISBN-0-7058-1320-7) Copyright. Avail: HMSO, London, Engl. £ 5.00

This report contains the details of development of a system, comprising of a piezoelectric transmitter and two electromagnet acoustic transducers (EMATS) as receivers, which makes accurate relative measurements of the ultrasonic velocity of SH plate waves at 0.5 MHz. This system has been used to measure ultrasonic velocities for propagation along the rolling direction, transverse direction and at intermediate angles on a number of plates of aluminum, stainless steel, copper and brass. In each case the velocities for waves propagating along the rolling direction and transverse direction agree to within experimental error. This supports the use of such an approach as a valid basis for the measurement of residual stresses. Ways of improving the transducer design to eliminate the use of piezoelectric transducers and ultimately enable application to bulk specimens are discussed.
Author

N85-25791 Central Electricity Generating Board, London (England).
THE GAMMA THERMOMETER: A NEW TYPE OF FIXED INTERNAL INSTRUMENTATION DEVELOPED BY EDF
G. Beraud and F. Hourtoulle 7 Mar. 1985 13 p refs Transl. into ENGLISH from Rev. Gen. Nucl. (France), no. 5, Sep.-Oct. 1983 p 389-393
(BLL-CE-Trans-8080-(9022.09)) Avail: British Library Lending Div., Boston Spa, England

The need for a sensor capable of providing a continuous measurement of local nuclear power and which would be robust, durable and reliable, led to the undertaking of the development of a new type of detector: the gamma thermometer (THG). After a historical survey, the principle and structure of the instruments used in EDF's PWR reactors are described. An extensive experimental program was undertaken to validate the methods of analysis and calibration and the thermal and nuclear models used. Finally, the prospects for the development and the future of this sensor are outlined. Author

N85-25792*# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
ADVANCED SMOKE METER DEVELOPMENT SURVEY AND ANALYSIS Final Report
R. W. Pitz, C. M. Penney, C. M. Stanforth, and W. M. Shaffernocker Nov. 1984 59 p refs
(Contract NAS3-23532)
(NASA-CR-168287; NAS 1.26:168287) Avail: NTIS HC A04/MF A01 CSCL 14B

Ideal smoke meter characteristics are determined to provide a basis for evaluation of candidate systems. Five promising techniques are analyzed in detail to evaluate compliance with the practical smoke meter requirements. Four of the smoke measurement concepts are optical methods: Modulated Transmission (MODTRAN), Cross Beam Absorption Counter (CBAC), Laser Induced Incandescence (LIN), and Photoacoustic Spectroscopy (PAS). A rapid response filter instrument called a Taper Element Oscillating Microbalance (TEOM) is also evaluated. For each technique, the theoretical principles are described, the expected performance is determined, and the advantages and disadvantages are discussed The expected performance is evaluated against each of the smoke meter specifications, and the key questions for further study are given. The most promising smoke meter technique analyzed was MODTRAN, which is a variation on a direct transmission measurement. The soot-laden gas is passed through a transmission cell, and the gas pressure is modulated by a speaker. B.W.

N85-25793*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PERFORMANCE OF CHARGE-INJECTION-DEVICE INFRARED DETECTOR ARRAYS AT LOW AND MODERATE BACKGROUNDS
M. E. McKelvey, C. R. McCreight, J. H. Goebel, and A. A. Reeves Mar. 1985 26 p refs
(NASA-TM-86667; A-85064; NAS 1.15:86667) Avail: NTIS HC A03/MF A01 CSCL 14B

Three 2 x 64 element charge injection device infrared detector arrays were tested at low and moderate background to evaluate their usefulness for space based astronomical observations. Testing was conducted both in the laboratory and in ground based telescope observations. The devices showed an average readout noise level below 200 equivalent electrons, a peak responsivity of 4 A/W, and a noise equivalent power of 3x10 sq root of W/Hz. Array well capacity was measured to be significantly smaller than predicted. The measured sensitivity, which compares well with that of nonintegrating discrete extrinsic silicon photoconductors, shows these arrays to be useful for certain astronomical observations. However, the measured readout efficiency and frequency response represent serious limitations in low background applications. Author

N85-25794*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRANSIENT TECHNIQUE FOR MEASURING HEAT TRANSFER COEFFICIENTS ON STATOR AIRFOILS IN A JET ENGINE ENVIRONMENT
Herbert J. Gladden and Margaret P. Proctor 1985 17 p refs Proposed for presentation at the 21st Joint Propulsion Conf., Monterey, Calif., 8-10 Jul. 1985; sponsored by AIAA, SAE and ASME
(NASA-TM-87005; E-2501; NAS 1.15:87005) Avail: NTIS HC A02/MF A01 CSCL 14B

A transient technique was used to measure heat transfer coefficients on stator airfoils in a high-temperature annular cascade at real engine conditions. The transient response of thin film thermocouples on the airfoil surface to step changes in the gas stream temperature was used to determine these coefficients. In addition, gardon gages and paired thermocouples were also utilized to measure heat flux on the airfoil pressure surface at steady state conditions. The tests were conducted at exit gas stream Reynolds numbers of one-half to 1.9 million based on true chord. The results from the transient technique show good comparison with the steady-state results in both trend and magnitude. In addition, comparison is made with the STAN5 boundary layer code and shows good comparison with the trends. However, the magnitude of the experimental data is consistently higher than the analysis. Author

N85-25795*# Alabama Univ., Huntsville.
SUPERCONDUCTING GYROSCOPE RESEARCH Final Report
J. B. Hendricks and G. R. Karr Feb. 1985 203 p refs
(Grant NAS8-29316)
(NASA-CR-171406; NAS 1.26:171406) Avail: NTIS HC A10/MF A01 CSCL 14B

Four basic areas of research and development of superconducting gyroscopes are studied. Chapter 1 studies the analysis of a SQUID readout for a superconducting gyroscope. Chapter 2 studies the dependence of spin-up torque on channel and gas properties. Chapter 3 studies the theory of super fluid plug operation. And chapter 4 studies the gyro rotor and housing manufacture. E.R.

N85-25796# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A QUANTITATIVE IMAGE EVALUATION STUDY OF A CONCURRENT PHOTON AMPLIFICATION TREATED EMULSION M.S. Thesis
K. E. Kern 1984 97 p
(AD-A151831; AFIT/CI/NR-85-8T) Avail: NTIS HC A05/MF A01 CSCL 14/5

This thesis evaluates the effect of concurrent photon amplification (CPA) on Kodak Tri-X Pan emulsion in regard to image quality. The study evaluated detective quantum efficiency (DQE), modulation transfer function (MTF), and information content (IC) as a function of exposure in a comparison between normal exposure and CPA. The results showed CPA to enhance image quality relative to normal exposure at very low exposure levels. As the exposure was increased, normally exposed images became comparable and then exceeded CPA exposures in image quality. The exposure level at which normal exposure became preferential was distinct with each image quality measure. A computer program is included. GRA

N85-25797# Sandia Labs., Albuquerque, N. Mex.
PARTICLE CURTAIN GENERATOR FOR OPTICAL PROPERTY MEASUREMENTS OF SOLID PARTICLES
G. H. Prescott and B. R. Steele Jan. 1985 10 p
(Contract DE-AC04-76DR-00789)
(DE85-005784; SAND-84-8255) Avail: NTIS HC A02/MF A01

A device to form a particle curtain that is one inch in width and one particle in thickness has been designed, fabricated and tested. This particle curtain generator will form curtains using free flowing spherical or poor flowing angular particles. Particle sizes varying from 100 to 1000 microns were tested at various flow rates. This device is being used at Battelle Pacific Northwest Laboratory to aid in making optical property measurements on

candidate materials for the solid particle receiver work being done by Sandia. DOE

N85-25798# Harvard Univ., Cambridge, Mass.
DEVELOPMENT AND DIFFUSION OF AUTOMATED CLINICAL CHEMISTRY ANALYZERS Report, 1 Jul. 1979 - 31 Oct. 1982
H. Marks and H. V. Fineberg Aug. 1984 212 p refs
(Grant PHS-HS-03314)
(PB85-150696; NCHSR-84/240) Avail: NTIS HC A10/MF A01 CSCL 14B

The development and diffusion of automated clinical chemistry analyzers are described as an example of the process of technological change in medicine. This involves an elaboration and refinement of the conceptual framework, a historical description of development and use of three classes of analyzer, an investigation of user innovation, and the use of survey data to study patterns of diffusion. The emerging theory of development and diffusion differs from traditional theory in significant respects, assigning a more prominent and active role to the user in development, and characterizing development and diffusion as incremental and iterative rather than discrete and sequential. GRA

N85-25799# National Bureau of Standards, Boulder, Colo. National Engineering Lab.
CALORIMETER FOR MEASURING HIGH-ENERGY OPTICAL PULSES
P. A. Simpson, E. G. Johnson, and S. M. Etzel Oct. 1984 169 p Sponsored in part by Aerospace Guidance and Metrology Center
(PB85-160695; NBSIR-84/3008) Avail: NTIS HC A08/MF A01 CSCL 14B

Two similar calorimeters for measuring laser pulses in the range 1 kJ to 15 kJ are described. The calorimeters, which are electrically calibrated, can be operated anywhere from the ultraviolet to infrared by selecting the proper materials for the volume absorber and deflecting mirror. Operation of each calorimeter is controlled by a dedicated desk top computer. The theoretical basis for the calorimeters is given as are the constructional and operational details. The computer programs that are used are included in the appendices. GRA

N85-25800# Brown Univ., Providence, R. I. Dept. of Physics.
DEVELOPMENT OF SOLID STATE INFRARED EMITTERS FOR GAS DETECTION APPLICATIONS Final Report, Jun. 1980 - Dec. 1983
H. J. Gerritsen, E. E. Crisman, and J. T. Daly Mar. 1984 70 p refs
(PB85-148450; GRI-84/0105) Avail: NTIS HC A04/MF A01 CSCL 14B

The liquid phase epitaxial growth of InAs(1-y)Sb(y) (y = or < 0.12) for applications as long wavelength (3.5 micrometers-5 micrometers) infrared emitting diodes has been investigated. The equilibrium phase diagrams of binary In-As and In-Sb and ternary In-As-Sb have been calculated using a simple solution model. The epitaxial layers were deposited on (111)B and (100) oriented InAs substrates in the temperature range 500C-750C. Measurements of liquids temperatures indicate that while reasonable agreement with the calculated phase diagram is obtained, some of the parameters used in the calculation are in error. Measurements of solidus composition y as a function of epitaxial layer thickness show that layers of constant composition can be obtained. GRA

N85-25801# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TRAJECTORY MEASUREMENTS FOR TAKE-OFF AND LANDING TESTS AND OTHER SHORT-RANGE APPLICATIONS, VOLUME 16
P.deBenque dAgut (Centre d'Essais en Vol, Bretigny-sur-Orge, France), H. Riebeek (Fokker B.V., Amsterdam), and A. Pool, ed. (National Aerospace Lab., Amsterdam) Jan. 1985 86 p refs 16 Vol.
(AGARD-AG-160-Vol-16; AGARDograph-160;
ISBN-92-835-1487-4) Avail: NTIS HC A05/MF A01

A review of the methods that are used for short-range trajectory measurements is presented. This report also reviews the instrumentation requirements of the applications: take-off and landing performance measurement, autoland performance measurement, noise measurement and flight inspection of radio beacons. Optical methods (including lasers), methods using radio or radar and methods using inertial sensing are discussed. B.W.

N85-25285# Joint Publications Research Service, Arlington, Va.
HOLOGRAPHY IN SPACE Abstract Only
V. M. Tuchkevich, Y. P. Semenov, and S. B. Gurevich *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 1-11 Transl. into ENGLISH from Zemly i Vselennaya (USSR), no. 3, May-Jun. 1984 p 17-24 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25357# Joint Publications Research Service, Arlington, Va.
CALCULATION OF IMAGE SHIFT IN PANORAMIC PHOTOGRAPHY Abstract Only
B. M. Miller and M. N. Morskova *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 120 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geod. i Aerofotosyemka (USSR), no. 4, Jul.-Aug. 1984 p 81-89 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25595# Joint Publications Research Service, Arlington, Va.
INSTRUMENT FOR MEASURING DISPERSIONAL DISTORTIONS IN OPTICAL FIBERS AND CABLES Abstract Only
Ya. V. Alishev, A. A. Maryenko, Yu. V. Smirnov, V. N. Uryadov, and V. I. Sinkevich *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 60 refs Transl. into ENGLISH from Electrosvyaz (Moscow), no. 9, Sep. 1984 p 43-44 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25623# Joint Publications Research Service, Arlington, Va.
PROFESSIONAL COMMITTEE ON SOLID PROPULSION HOLD CONFERENCE
In its China Rept.: Sci. and Technol. (JPRS-CST-85-007) 15 Mar. 1985 p 41-46 refs Transl. into ENGLISH from Yuhang Xuebao (Beijing, China), no. 2, 30 apr. 1984 p 91 (For primary document see N85-25621 15-31)
Avail: NTIS HC A08/MF A01

N85-25665# Joint Publications Research Service, Arlington, Va.
NEW SENSOR FOR INDUSTRIAL METROLOGY DEVELOPED
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 77-81 Transl. into ENGLISH from Neuer Tag (Frankfurt-Oder, East Germany), 5 Jan. 1985 p 2 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N85-25802 Stanford Univ., Calif.
PRINCIPLE AND DESIGN OF A MEDIUM-ENHANCED FREE-ELECTRON LASER Ph.D. Thesis
Anne-Marie Fauchet 1984 119 p
Avail: Univ. Microfilms Order No. DA8429507

Free-electron lasers are widely tunable sources of coherent radiation. The standard vacuum free-electron laser consists of a relativistic electron beam propagating invacuum in a periodic magnetic field. It readily generates infrared radiation using medium energy (50 MeV) electrons. Visible and ultraviolet radiation production requires costly higher energy electrons. This thesis shows that, if a free-electron laser is loaded with a gas, its wavelength of oscillation as determined by phase-matching condition, is shorter than in vacuum for the same electron energy

and magnetic field parameters. For example, with a 2.5 cm period, 5kG magnetic field and a 44 MeV electron beam a vacuum free-electron laser would generate 4 micro m radiation, whereas if filled with 0.9 atm of hydrogen gas it would generate 0.25 micro m radiation. The analysis of the gas-loaded free-electron laser (GFEL) is developed following that of the vacuum free-electron laser. Dissert. Abstr.

N85-25803 British Aerospace Dynamics Group, Bristol (England). Laser Damage Section.
LASER INDUCED DAMAGE OF ZINC SULPHIDE
J. Weston Jun. 1982 17 p refs
(BAe-BT-13363) Copyright. Avail: Issuing Activity

To establish the energies and powers required to damage the infrared transmitting material ZnS, a sample was irradiated with pulsed laser radiation. The laser source was a CO2 TEA laser emitting a pulse of energy 113 mJ with a peak power of 700 kW. The single-shot damage threshold is 158 MW/sqcm (295/sqcm) at 10.6 microns. Low levels of multishot irradiation cause surface deterioration, but this does not affect transmission properties at 10.6 microns. At higher powers, the sulfide melts. The dominant damage mechanism is different at low power densities than at high power densities. Author (ESA)

N85-25804# Hughes Research Labs., Malibu, Calif.
EXPERIMENTAL AND THEORETICAL STUDIES OF LASER COOLING AND EMITTANCE CONTROL OF NEUTRAL BEAMS Annual Report, 6 Jan. 1983 - 30 Sep. 1984
R. A. McFarlane, D. G. Steel, R. S. Turley, J. F. Lam, and A. J. Palmer Oct. 1984 16 p
(Contract F49620-82-C-0004; AF Proj. 2301)
(AD-A149215; AFOSR-84-1163TR) Avail: NTIS HC A02/MF A01 CSCL 20/8

Experimental and theoretical progress has been made in the stress of experimental observation of the Optial Sten-Gerlach Effect (OSGE), resonant two photon ionization of neutral hydrogen, and a theoretical study of pi-pulse cooling. In the OSGE studies, spatial resolution has been improved, as well as the spatial beam profile monitor, magnetic substrate selection, the size of the interaction region, the signal to noise ratio, and the computer codes for acquiring and analyzing the data. In the resonant two-photon ionization of neutral hydrogen, a neutral hydrogen beam with a density of 10 to the 12th power/cc has been produced and the development of the visible ultraviolet source is progressing. Author

N85-25805# Defense Intelligence Agency, Washington, D.C. Directorate for Scientific and Technical Intelligence.
BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS, NUMBER 67, SEPTEMBER-OCTOBER 1983
5 Dec. 1984 124 p
(AD-A151199; DIA-DST-2700Z-001-85) Avail: NTIS HC A06/MF A01 CSCL 20/5

This is the Soviet Laser Bibliography for September-October 1983, and is No. 67 in a continuing series on Soviet laser developments. The coverage includes basic research on solid state, liquid, gas, and chemical lasers; components; nonlinear optics; spectroscopy of laser materials; ultrashort pulse generation; crystal growing; theoretical aspects of advanced lasers; and general laser theory. Laser applications are listed under biological effects; communications; beam propagation; adaptive optics; computer technology; holography; laser-induced chemical reactions; measurement of laser parameters; laser measurement applications; laser-excited optical effects; laser spectroscopy; beam-target interaction; and plasma generation and diagnostics. GRA

N85-25806# Illinois Univ., Urbana. Dept. of Mechanical and Industrial Engineering.
A PLASMA INITIATION-FLOW CHAMBER TO STUDY CW LASER BEAMED ENERGY ABSORPTION IN LIGHT GASES Annual Report, 1 Feb. 1983 - 30 Jan. 1984
H. Krier, J. Mazumder, R. J. Glumb, T. D. Bender, and T. J. Rockstroh 1 Mar. 1984 75 p
(Grant AF-AFOSR-0041-83)
(AD-A151225; UILU-ENG-84-4002; AFOSR-85-0205TR) Avail: NTIS HC A04/MF A01 CSCL 20/5

This report summarizes the research work that has been done in the past year, investigating the use of laser-sustained plasmas for propulsion applications. One focus of the research is the initiation of plasmas in inert gases using metal vapor seedants. Another is to define the operating characteristics of the dual-flow design by measuring temperatures, number densities, and global absorption. A pressure chamber has been built to permit observations of the plasma under wide ranges of pressure, flow conditions, and beam geometry. Laser energy absorption will be measured using a high-flux calorimeter, and temperature profiles will be found using a combination of spectroscopic relative line intensity measurements, thermocouples, infrared thermography, and possible laser induced fluorescence. The report summarizes the design and construction of the pressure chamber, optics, and related equipment, and discusses the techniques which will be used to analyze temperatures throughout the flowfield. GRA

N85-25807# Naval Postgraduate School, Monterey, Calif.
HIGH ENERGY LASERS: A PRIMER ON DIRECTED ENERGY WEAPONS FOR SPACE USE M.S. Thesis
R. F. Ziska Sep. 1984 86 p
(AD-A151279) Avail: NTIS HC A05/MF A01 CSCL 15/3

The rapid and inevitable commercialization and exploitation of space, which is now gaining increased momentum as the Space Shuttle program settles into a regular monthly schedule, is inescapably increasing our dependence on space-based systems of all kinds. These systems have become vital national interests, the defense of which must be considered whenever realistic war-time scenarios are developed. Consequently, the introduction of weapons into the space environment is an important option, the potential of which must be thoroughly investigated so as not to unwittingly jeopardize critical national assets and ultimately national defense. This thesis is intended to be a semi-technical primer on directed energy laser weapons for utilization in the space environment. The rationale for the selection of space-based laser weapon systems is examined. Additionally, the basic concepts, components, and operations of three of the most promising methods for the generation of high-power laser energy in space are presented. GRA

N85-25808# Systems Research Labs., Inc., Dayton, Ohio. Research Applications Div.
ELECTRIC DISCHARGE EXCITATION AND ENERGY SOURCE INTEGRATION Final Report, 30 Jan. 1980 - 31 Dec. 1983
D. F. Grosjean Wright-Patterson AFB, Ohio AFWAL 6 Jan. 1985 170 p
(Contract F33615-79-C-2084)
(AD-A151502; SRL-6569; AFWAL-TR-84-2074) Avail: NTIS HC A08/MF A01 CSCL 20/3

Methods of transferring energy from electrical storage to an electro-negative gas discharge at high repetition rates of approx. < 1.5 kHz examined. The electrical-energy range of interest is 1 - 10 J. The XeCl gas-discharge laser system is used as a representative discharge. Computer modeling of the pertinent kinetics of a He/Xe/HCl gas mixture which was performed in conjunction with various configurations of pulse-forming networks is described; gas thyratrons and magnetic switches were used as switching elements. Due to the relatively constant E/N characteristics of this system, a stripline arrangement is shown to provide the most efficient method of energy transfer for pulse lengths approx < 50 nsec. Capacitor discharge methods are applicable to shorter pulse lengths. Construction of a closed-cycled, high-rep-rate XeCl gas-discharge laser is described. Operation of an X-ray preionized system at 1.5 kHz is also detailed; no contamination was observed in this configuration. The application of the XeCl laser as a pump source for a high-rep-rate, high-average-power dye laser is also described. A flowing-dye jet was utilized in order to avoid liquid-cell boundary-layer problems of a fast-flow stream. The optical quality of the jet stream was the limiting factor in achieving the power goals. A method of achieving high efficiency

in a rare-gas-halide system is proposed via a magnetic switch and prepulse arrangement in conjunctions with a stripline PFN. GRA

N85-25809# Vanderbilt Univ., Nashville, Tenn. Dept. of Chemistry.
SPECTROSCOPIC STUDIES OF LASING TRANSITIONS IN THE DIATOMIC MERCURY HALIDES Final Report, 1 May 1981 - 30 Sep. 1984
J. Tellinghuisen Feb. 1985 34 p
(Contract N00014-81-K-0477; DA Proj. RR0-1107)
(AD-A151553) Avail: NTIS HC A03/MF A01 CSCL 07/4

The B-X, C-X, and D-X emission transitions of HgCl, HgBr and HgI and the B-X transition of XeF have been photographed and analyzed for isotopically pure HgX and XeF molecules. New methods have been devised for fitting data and approximating potential curves for heavy diatomics like these molecules. Results of the analysis for these molecules offer significant improvements in their spectroscopic parameters and related properties, such as potential curves, Franck-Condon factors, dissociation energies and partition functions. Originator-supplied keywords include: mercury halides, zenon fluoride, HgCl, HgBr, HgI, XeF, electronic transition lasers, electronic spectroscopy, diatomic spectroscopy, vibrational potential curves, Franck-Condon factors, dissociation energies and partition functions. GRA

N85-25810# Department of the Army, Washington, D. C.
INJECTION CONTROLLED LASER TRANSMITTER WITH TWIN LOCAL OSCILLATORS Patent Application
P. P. Chenausky and W. J. Green, Jr., inventors (to Army) Filed 25 Feb. 1985 13 p
(AD-D011577; US-Patent-Appl-SN-704816) Avail: NTIS HC A02/MF A01 CSCL 20/5

A heterodyne carbon dioxide optical Doppler radar is described which comprises a ring type of transmitter laser and twin local oscillator lasers which are automatically controlled to operate at a difference frequency equal to the intermediate frequency of the radar, which may be in the VHF band. The output of one of the twin lasers is injected into the transmitter laser for stabilization purposes and the output of the other of the twin lasers is heterodyned with the received target return signals to form the radar's intermediate frequency signal. GRA

N85-25811# Department of the Air Force, Washington, D.C.
METHOD AND APPARATUS FOR HIGH SPEED, SUSTAINED RECORDING OF INFRARED LASER BEAM PATTERNS Patent Application
J. M. Geary, inventor (to Air Force) Filed 22 Aug. 1984 13 p
(AD-D011585; US-Patent-Appl-SN-643138) Avail: NTIS HC A02/MF A01 CSCL 20/5

A method of photographically recording at high speed the far field pattern of a high energy infrared laser beam over a selected period of time for providing rapid repetitive samples of information on beam parameters such as far field beam intensity, jitter, and absolute beam size and power is disclosed. A sample from high energy infrared laser beam is directed into an enclosure that is light tight to visible radiation and contains an operating lensless movie camera loaded with suitable movie film. The infrared beam is focused on the film plane of the camera so that consecutive frames of the film are irradiated by the infrared beam each time the camera shutter is open. The period of irradiation is of sufficient duration to sensitize the film to visible radiation in the areas where the infrared radiation impinges on the film. The position of the camera shutter is detected and an electrical trigger signal generated just before the shutter is closed for each frame. The trigger signal is applied to appropriate circuitry which actuates a light source to generate a pulse of visible light that irradiates the film plane of the camera near the end of each shutter movement to expose each frame of the film. The exposed film strip is developed to provide a continuous record of the infrared laser beam characteristics over the selected period of time. GRA

N85-25812# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
STIMULATED BRILLOUIN SCATTERING REFLECTIVITY IN THE PRESENCE OF VARIOUS ABERRATORS M.S. Thesis
T. F. Lowum Dec. 1984 89 p
(AF Proj. 2001)
(AD-A151750; AFIT/GE/PH/84D-1) Avail: NTIS HC A05/MF A01 CSCL 20/5

The phase-conjugate nature of a light wave reflected by Stimulated Brillouin Scattering was studied to determine the amount of compensation provided by SBS for aberrations in the system. The SBS medium used was CS2 liquid contained in a cylindrical glass cell. Two different types of cell were used: one with a narrow capillary waveguide inside it and another without any type of waveguide. The ability of SBS to correct for aberrators which change the polarization of the beam, focus the beam, or diffract the beam was studied. These aberrators included a sapphire quarter-wave plate, a Cornu Pseudodepolarizer, a cylindrical lens telescope, a single cylindrical lens, over-lapping microscope slides (one-dimensional apertures), and a piece of wire mesh (two-dimensional apertures). The SBS return compensated either partially or completely for all of the aberrators tested. The results also indicated that the cell with the waveguide had a much lower SBS threshold than the other cell. GRA

N85-25813# Department of the Army, Washington, D. C.
GROUND SLOT WAVEGUIDE LASER Patent Application
P. P. Chenausky, E. H. Drinkwater, and L. M. Laughman, inventors (to Army) Filed 18 Mar. 1985 12 p
(AD-D011600; US-Patent-Appl-SN-712943) Avail: NTIS HC A02/MF A01 CSCL 20/5

A method of fabricating C02 waveguide type lasers of the type comprising a slot formed in a broad surface of a hard ceramic material, comprising grinding the slot in a conventional surface grinding machine in two steps. The first step utilizes a coarse grinding wheel and the second a finer grinding wheel. The resultant laser cavity can produce high optical power output when provided with RF excitation. GRA

N85-25814# Rochester Univ., N. Y.
LABORATORY FOR LASER ENERGETICS REPORT Annual Report, 1 Oct. 1983 - 30 Sep. 1984
Jan. 1985 199 p refs Sponsored in part by Empire State Electric Energy Research Corp., General Electric Co., New York State Energy Research and Development Authority, Northeast Utilities Service Co., Ontario Hydro, Southern California Edison Co., Standard Oil Co. and Rochester Univ.
(Contract DE-AC08-80DP-40124)
(DE85-007235; DOE/DP-40124/67) Avail: NTIS HC A09/MF A01

During the year, several major experimental campaigns were carried out on OMEGA which investigated illumination uniformity, coronal physics, energy transport and ablation, high-Z plasma dynamics, atomic physics and X-ray laser physics, and fusion diagnostic development. Other laser-fusion research conducted during FY84 includes: (1) hydrodynamic simulations of thermal self-focusing in laser-produced plasmas; (2) holography was demonstrated as a potential method of characterizing the equivalent-target intensity distributions; (3) a conceptual design of a direct-drive laser-fusion reactor was developed; (4) a model for the Raman spectra observed in laser experiments was developed; (5) the shaping of electrical signals in microstriplines; (6) target-illumination uniformity; (7) microencapsulation techniques; (8) a new engineering criterion was developed for thin-film coatings; and (9) a collaboration with Los Alamos on direct-drive pellet design for large KrF systems, single-shell designs. DOE

N85-25815# Brookhaven National Lab., Upton, N. Y.
FREE ELECTRON LASERS FOR THE EUV SPECTRAL REGION
J. B. Murphy and C. Pellegrini 3 Sep. 1984 29 p refs Presented at Free Electron Laser Conf., Castelgrandolfo, Italy, 3 Sep. 1984
(Contract DE-AC02-76CH-00016)
(DE85-006804; BNL-35732; CONF-8409144-4) Avail: NTIS

HC A03/MF A01

Using the system described, an electron storage ring with an undulator in a special bypass section, high intensity coherent radiation can be obtained by sending the beam through the undulator and using the FEL collective instability to produce radiation. Compared to other systems, such as an FEL oscillator or a transverse optical klystron, this system has the advantage that it does not require mirrors to form an optical cavity or an input high power laser to bunch the electron beam. On the other hand, by its very nature, this system can only produce high intensity, short radiation pulses with a repetition rate of the order of 10 Hz. The storage ring needed to operate the system is characterized by a small transverse emittance. The other important ring parameter is the longitudinal coupling impedance. DOE

N85-25816# Texas Univ., Austin.
KINETIC STUDIES FOLLOWING STATE SELECTIVE LASER EXCITATIONS
J. W. Keto 1985 25 p refs
(Contract DE0FG05-84ER-13191)
(DE85-007173; DOE/ER-13191/1) Avail: NTIS HC A02/MF A01

State-selective inelastic and reactive collisions of xenon atoms and eximers were studied. The reactants are excited by multiphoton laser absorption while product channels are observed by their fluorescence. For any mixture of gases, the reactants which can be studied by obtaining excitation spectra are determined, where the intensity of laser induced fluorescence is measured as a function of laser frequency. The product energy disposal in product channels was determined by measuring the fluorescence spectra at fixed laser frequencies which excite reactants. State-to-state reaction rates are measured for the reactants by observing the time dependence of the fluorescence of both the reactants and products following excitation by the laser. The experiments are similar and complimentary to those using synchrotron radiation. For excited state energies up to 15 eV, multiphoton excitation offers the advantages of better time and energy resolution, a greater choice of excited state multiplicity, and a significant longer absorption length. DOE

N85-25817# Los Alamos Scientific Lab., N. Mex.
SUPERFINE LASER POSITION CONTROL USING STATISTICALLY ENHANCED RESOLUTION IN REAL TIME
B. L. Kortegaard 1985 11 p refs Presented at SPIE Tech. Symp. on Opt. and Electroopt. Eng., Los Angeles, 23-25 Jan. 1985
(Contract W-7405-eng-eng-36)
(DE85-005643; LA-UR-84-4036; CONF-850137-2) Avail: NTIS HC A02/MF A01

An electronic control system is described which analyzes digitized TV images to simultaneously position 96 time-and-space multiplexed beams for a large KrF laser system. Degradation of position resolution due to the intervals between digitization is discussed, and improvement of this resolution by using inherent system noise is demonstrated. The methods shown resolve arbitrary intensity boundaries to small fraction of the discrete sample spacing. DOE

N85-25818# European Space Agency, Paris (France).
POSSIBLE USES OF TUNABLE DIODE LASERS IN INFRARED SPECTROSCOPY
Philippe Prastault Nov. 1984 182 p refs Transl. into ENGLISH of "Etude des Possibilites Offertes en Spectroscopie Infrarouge par les Diodes Laser Accordables" rept. ONERA-NT-1983-4 ONERA, Paris, 1983 Original language document was announced as N84-25782
(ESA-TT-869; ONERA-NT-1983-4) Avail: NTIS HC A09/MF A01

The uses of semiconductor lasers that are tunable in the infrared wavelengths are discussed. A test was constructed to characterize the spectral and spatial properties of the laser emission from different diodes and high resolution spectra were measured for CH4, NO and NO2. Spectral interpretation shows the great advantage this technique holds in molecular spectroscopy. The semiconductor laser is found to be adaptable to difficult environments and capable of producing valuable information on reactions in combustive phenomena. Temperature and concentration are measured simultaneously in a well stirred reactor, from an absorption line plot. The data on this come from a CO line. Author (ESA)

N85-25819# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
17 Apr. 1985 109 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-010) Avail: NTIS HC A06/MF A01

Technology affairs, standardization, and activities in applied sciences, life sciences, and ecology are reported. The development of a science park is announced. For individual titles, see N85-25820 through N85-25822.

N85-25820# Joint Publications Research Service, Arlington, Va.
DISCHARGE CHARACTERISTICS OF HIGH-PRESSURE, FAST-DISCHARGE XeCl EXCIMER LASER
Liu Dawei *In its* China Rept: Sci. and Technol. (JPRS-CST-85-010) 17 Apr. 1985 p 27-36 refs Transl. into ENGLISH from Wuli Xuebao (Beijing, China), v. 33, no. 11, Nov. 1984 p 1512-1519 (For primary document see N85-25819 15-36)
Avail: NTIS HC A06/MF A01

Based on accurate measurements of voltage and current between the electrodes of a fast-discharge XeCl excimer laser and together with computer analysis, the dynamic impedance of the laser discharge plasma under high pressure (3 to 8 atmospheres) was obtained. The impedance was found to drop to a few ohms in a few nanoseconds. The discharge peak current and the corresponding impedance of the laser cavity at various charging voltages were studied. The results show that it is neither practical nor necessary to match the impedance of the discharge plasma and the impedance of the transmission line. Author

N85-25821# Joint Publications Research Service, Arlington, Va.
PREDISCHARGE PARAMETERS OF SF6-CO2 DETERMINED BY LASER
Li Zhengying *In its* China Rept: Sci. and Technol. (JPRS-CST-85-010) 17 Apr. 1985 p 37-47 refs Transl. into ENGLISH from Wuli Xuebao (Beijing, China), v. 33, no. 11, Nov. 1984 p 1529-1537 (For primary document see N85-25819 15-36)
Avail: NTIS HC A06/MF A01

A method is described which can be used to study avalanches in electronegative gases and then to determine electron swarm parameters (ionization coefficient a, adsorption coefficient eta, and drift velocity v) including the number and distribution of primary electrons released from the cathode of a parallel electrode configuration by high energy laser pulses. The method was used to study predischarge parameters in mixtures of SF6 and CO2. Relations between the parameters (a/P, eta/P and v) and E/P (E is electric field, P is gas pressure) are given. A number above 10 to the 8th power of primary electrons was obtained. The measurement system used and improvements that can be made are also considered. Author

N85-25822# Joint Publications Research Service, Arlington, Va.
USE OF COMPUTER-AIDED DESIGN IN LARGE-COMPUTER DEVELOPMENT DESCRIBED c61
Liu Shenquan and Gu Yuan *In its* China Rept: Sci. and Technol. (JPRS-CST-85-010) 17 Apr. 1985 p 48-58 refs Transl. into ENGLISH from Jisuanji Yanjiu Yu Fazhan (Beijing, China), no. 6, Mar. 1983 p 1-7 (For primary document see N85-25819 15-36)
Avail: NTIS HC A06/MF A01

System simulation is described for a large, high-speed, pipelined vector processor with extremely complicated logic. It was assembled from small-scale integration (SSI) and some medium-scale integration (MSI) circuitry using ECL (emitter-coupled logic); the cards and boards were multilayered. There was one mainframe and one peripheral unit. Simulation systems for the register logic and the gate logic are discussed as well as the logic partitioning program system. Automatic wiring layout on printed circuit boards, card test code development, data conversion, module testing

language, core plane testing, and the circuit analysis system are examined. A.R.H.

N85-25655# Joint Publications Research Service, Arlington, Va.
MICROCOMPUTER CONTROLLED AUTOMATIC PEAK LOCKING OF LASER CIRCUIT
Yu Daoheng and Xie Boqing *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-013) 1 May 1985 p 49-53 Transl. into ENGLISH from Weijisuanji Yingyong (Beijing), v. 5, no. 1, Feb. 1985 p 56-58 (For primary document see N85-25652 15-31)
Avail: NTIS HC A07/MF A01

N85-26305# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF LASER EMISSION DISCHARGE CREATED BY PULSED CO2-LASER Abstract Only
E. M. Barkhudarov, G. V. Gelashvili, G. G. Gumberidze, D. I. Razmadze, and M. I. Taktakishvili *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 9 Transl. into ENGLISH from Fiz. Plazmy (Moscow), v. 10, no. 4, Jul. - Aug. 1984 p 757-761 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

N85-26306# Joint Publications Research Service, Arlington, Va.
THEORETICAL INVESTIGATION OF LASING IN 4.3 MICRON REGION IN CO2 LASER Abstract Only
M. M. Ivanenko, S. A. Trushin, and V. V. Churakov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 10-11 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 46, no. 3, Sep. 1984 p 408-415 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

N85-26307# Joint Publications Research Service, Arlington, Va.
SUBMILLIMETER-BAND SOLID STATE DISTRIBUTED FEEDBACK LASER Abstract Only
A. G. Aleksanyan, G. P. Boyakhchyan, and E. G. Mirzavekyan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 12-13 Transl. into ENGLISH from Izv. Akad. Nauk Armyanskoy SSR: Fiz. (Yerevan, USSR), v. 19, no. 4, Jul. - Aug. 1984 p 198-205 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

N85-26308# Joint Publications Research Service, Arlington, Va.
WAVEGUIDE PHENOMENA IN DENSE RELAXING GASES AND THEIR USE IN CHEMICAL AND GAS-DYNAMIC LASERS Abstract Only
B. D. Barmashenko, V. A. Kochelap, and V. V. Naumov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 13-14 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 9, Sep. 1984 p 1763-1771 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

N85-26309# Joint Publications Research Service, Arlington, Va.
AMPLIFICATION OF SCATTERED INDUCED RADIATION FLUX IN HIGH-GAIN LASER RODS Abstract Only
B. S. Skorobogatov and A. I. Usoskin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 16-17 Transl. into ENGLISH from Optika i Spektroskopiya (Leningrad), v. 56, no. 6, Jun. 1984 p 1099-1103 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

N85-26310# Joint Publications Research Service, Arlington, Va.
INDUSTRIAL LASER USE EXPANDING IN THE USSR
Ye. P. Velikhov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 18-23 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 14, Apr. 1983 p 2 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N85-25823 Welding Inst., Cambridge (England).
WELDING TECHNOLOGY: JAPAN
W. Lucas, ed. 1984 133 p refs Presented at a symposium (ISBN-0-85300177-4) Copyright. Avail: Issuing Activity

Advances in Japanese welding technology are explored. Topics cover material selection, welding processes, narrow gap techniques, fabrication practice, power source design, automation, robot technology, and production organization. For individual titles, see N85-25824 through N85-25835.

N85-25824# Whessoe Ltd., Darlington (England).
THE DEVELOPMENT AND IMPLEMENTATION OF ADVANCED WELDING TECHNOLOGY
W. P. Carter *In* Welding Inst. Welding Technol.: Japan 1904 p 1-3 (For primary document see N85-25823 15-37)
Avail: Issuing Activity

The principal reasons for adopting more advanced techniques must be identified and the possible limitations on the adoption of mechanized/automated systems must also be considered for specific applications. Three aspects of welding technology examined include the organization of development activities when considering new technology implementation, the importance of material quality developments in achieving success, and technology for welding tunnel lining closing seams, helical pipes to large tubes, and overhead tubes to plate joints. A.R.H.

N85-25825# Kawasaki Steel Corp., Tokyo (Japan).
STUDIES OF FERRITIC FILLER METALS FOR WELDING 9 PERCENT NICKEL STEEL
K. Agusa, M. Kosho, N. Nishiyama, and J. Kudoh *In* Welding Inst. Welding Technol.: Japan 1984 p 4-9 (For primary document see N85-25823 15-37)
Avail: Issuing Activity

The Japanese studies on the ferritic filler welding of 9% Ni steel are summarized, and the pure argon shielded MIG welding process is detailed. The CVN properties and fracture toughness of the ferritic weld metal can be greatly improved by lowering the oxygen and silicon contents. The addition of rare earths to the welding wire stabilizes the arc in a pure argon shield, thereby ensuring weld metals with low oxygen. Five crogenic vessels, constructed by the MIG welding process, are now exhibiting satisfactory performance in service. Author

N85-25826# Babcock Power Ltd., London (England).
COMPOSITIONAL CONTROL OF PLATE STEELS
I. G. Hamilton *In* Welding Inst. Welding Technol.: Japan 1984 p 10-21 (For primary document see N85-25823 15-37)
Avail: Issuing Activity

Many welding engineers who are most particular about welding equipment, consumables, and procedure show no curiosity about parent material, how it is manufactured and how the manufacturing route may affect its weldability. In Japan the methods of bulk steel production of plates are primarily based on the use of the BOS unit to produce steel at extremely fast rates. A combination of various secondary steelmaking process is used to achieve the necessary analytical control of metal composition. No two steelmakers use exactly the same equipment and techniques. Degassing units, laddle furnaces, powder injection units, and the vacuum suction cleaner are described. Residual elements which are partially eliminated and those not eliminated are discussed. A.R.H.

N85-25827# Kawasaki Steel Corp., Tokyo (Japan).
DEVELOPMENT OF HIGH STRENGTH SHIP HULL STEEL FOR HIGH HEAT INPUT WELDING
Y. Nakano, E. Kobayashi, C. Shiga, T. Enami, Y. Hirai, and J. Kudoh *In* Welding Inst. Welding Technol.: Japan 1984 p 22-29 (For primary document see N85-25823 15-37)
Avail: Issuing Activity

The controlled rolling technique and the accelerated cooling technique are described. The mechanical properties of a high tensile strength ship hull steel with the specified yield strength of 353 N/sq mm, produced by the controlled rolling technique, and the resulting high heat input welded joint are examined. Author

N85-25828# Nippon Kokan Co. Ltd., Tokyo (Japan).
WELDING TECHNOLOGY AND ORGANISATION IN STEEL CONSTRUCTION
H. Nomura *In* Welding Inst. Welding Technol.: Japan 1984 p 30-43 refs (For primary document see N85-25823 15-37)
Avail: Issuing Activity

The research activity on welding process development in Japan is introduced. The welding processes and equipment which were developed and applied to the production of a LPG carrier, tubular components for offshore structures, pressure vessels, bridges, and LNG transportation pipelines are described. Welding wire/electrode consumption and quality control practice are also considered. A.R.H.

N85-25829# Mitsubishi Heavy-Industries Ltd., Tokyo (Japan).
APPLICATION OF NEW WELDING TECHNOLOGY IN THE FABRICATION OF NUCLEAR POWER PLANT
T. Nakazima, Y. Uratani, T. Shimoyama, N. Sakamoto, and T. Nagura *In* Welding Inst. Welding Technol.: Japan 1984 p 44-60 refs (For primary document see N85-25823 15-37)
Avail: Issuing Activity

The welding technology selected for the manufacture of the primary system (main) equipment of PWR power plants in Japan was, at first, the same submerged-arc and shielded metal-arc welding processes as those of the licensor in the USA; however, a welding method with higher quality and reliability is in use after extensive research and development. For joint welding, narrow-gap gas shielded arc welding (narrow-gap MIG, TIG welding) and electron beam welding are applied to obtain low heat-input, to reduce welding passes, and to control the welding parameters automatically. For overlay welding, plasma overlay welding with hot filler wire and electroslag overlay welding of 150mm width are applied to obtain a low dilution ratio and broad overlay; and for seal welding, high frequency pulse TIG seal welding is applied to ensure low heat-input and deep penetration. A.R.H.

N85-25830# Osaka Transformer Co. Ltd. (Japan).
ROBOTIC ARC WELDING
M. Kiyohara *In* Welding Inst. Welding Technol.: Japan 1984 p 61-71 (For primary document see N85-25823 15-37)
Avail: Issuing Activity

Several aspects which characterize robotic arc welding industry are presented including: (1) stimulating factors for rapid growth; (2) present status of robot technology; and (3) typical application in automobile industries. Author

N85-25831# Welding Inst., Cambridge (England).
AUTOMATION AND ROBOTICS IN WELDING
S. B. Jones *In its* Welding Technol.: Japan 1984 p 72-83 refs (For primary document see N85-25823 15-37)
Avail: Issuing Activity

Successful Japanese and European developments in advanced welding have a number of common features. These include the following aspects: (1) product oriented development; (2) the use of appropriate rather than necessarily advanced technology; and (3) a need and ability to ensure the acceptance and successful adoption of any new production approaches which may be found necessary. Japanese and European experience in the quest for improved arc welding productivity using examples from low and high levels of mechanization and automation within the arc welding spectrum are presented. Questions regarding the successful implementation of improved production methods are raised. E.A.K.

N85-25832# Osaka Transformer Co. Ltd. (Japan).
RECENT ADVANCES IN ARC WELDING EQUIPMENT AND THEIR APPLICATION
H. Yamamoto *In* Welding Inst. Welding Technol.: Japan 1984 p 84-95 (For primary document see N85-25823 15-37)
Avail: Issuing Activity

Efforts to convert from manual welding using covered electrodes (MMA) to semiautomatic and automatic welding using gas shielded arcs (GMA) were made to increase the efficiency of welding production and manpower savings. Changes were seen in the quality of the arc welding equipment and the utilization of electronic techniques was emphasized. The application of power electronics technologies helped significantly to make available highly accurate welding power sources at lower prices, thereby contributing to their wider acceptance by various industries. The rapid introduction of microelectronics technologies resulted in improvements in the various control functions of welding, and led to the development of a range of equipment using microcomputers. The trend of arc welding equipment design in Japan toward the application of more electronics and the background of such developments are discussed. E.A.K.

N85-25833# Welding Inst., Cambridge (England).
A CRITICAL REVIEW OF SELECTED RECENT ADVANCEMENTS IN ARC WELDING EQUIPMENT AND PROCESSES
W. Lucas *In its* Welding Technol.: Japan 1984 p 96-106 (For primary document see N85-25823 15-37)
Avail: Issuing Activity

Welding process developments are closely related to improvements in control technology. Information is presented on new welding processes and improvements in fabrication techniques. The automation of welding, particularly in the application of microprocessor technology is emphasized. E.A.K.

N85-25834# NEI Nuclear Systems Ltd., London (England).
SOME ASPECTS OF NUCLEAR PLANT FABRICATION IN JAPAN AND THE UK RELATING TO AUTOMATIC AND ROBOTIC ARC WELDING
L. Henderson *In* Welding Inst. Welding Technol.: Japan 1984 p 107-118 refs (For primary document see N85-25823 15-37)
Avail: Issuing Activity

The difference between the British and the Japanese approach to the implementation of fabrication technology are outlined. Firstly, there is a quicker response to the potential of any new technology in Japan, involving precompetitive development in the early stages. The environment for the successful application of advanced fabrication technology is greatly enhanced by the attitudes engendered by the quality circle commitment to achieve the critical combination of integrity and productivity. It is not apparent that the time scale of concept to full production process is any quicker than in the UK but the implementation process is started much earlier and usually on a broader front. In the UK new technology tends to be initiated in the application phase only when a target contract is realized as opposed to an early start aimed at potential business. The effect of this on competitiveness is obvious. However, awareness of the need for creating a structure to reinstate the overall UK manufacturing base to continuous improvement and application of advanced fabrication technology is becoming more acute. E.A.K.

N85-25835# Babcock Power Ltd., London (England).
WELDING TECHNIQUES IN PRESSURE PART TECHNOLOGY
J. C. Lochhead *In* Welding Inst. Welding Technol.: Japan 1984 p 119-129 (For primary document see N85-25823 15-37)
Avail: Issuing Activity

Japanese pressure part welding technology appears to have invested heavily in high rate deposition techniques. These include multiwire electroslag and submerged arc processes and numerous variations on the narrow gap principle. The Japanese success in the introduction of new technologies is a combination of four main factors, which are as follows: (1) market incentive; (2) Attitude; (3) NDE requirements; and (4) Financial Considerations. These factors can be related to their historical and cultural background. E.A.K.

N85-25836 Purdue Univ., Lafayette, Ind.
THE KINEMATIC CONTROL OF REDUNDANT MANIPULATORS

Ph.D. Thesis
William D. Fisher 1984 187 p
Avail: Univ. Microfilms Order No. DA8500371

The kinematic control of a redundant manipulator involves determining a feasible solution to the nonlinear kinematic equation which relates the joint motions of the manipulator to the corresponding end effector motions. The need for redundancy in a manipulator arises from the manipulator's inability to produce arbittrary differential end effector motions given any orientation and position of the end effector. Differential motions in the manipulator joint space are transformed into corresponding differential motions in the end effector space using the Jacobian matrix. Unfortunately, when the Jacobian matrix does not maintain maximal rank, the inverse mapping from the end effector space to the joint space is no loner onto and results in the end effector losing a degree of freedom. Even as the Jacobian matrix approaches a singularity, the required joint rates for the manipulator may become excessive and physically unrealizable. Criteria are developed to avoid the Jacobian matrix singularities of a redundant manipulator and still maintain total freedom of its end effector within the workspace. Integrating the criteria into the kinemmatic control of the manipulator allows for specifying continuously smooth end effector motions with bounded joint rates. Dissert. Abstr.

N85-25837 United Kingdom Atomic Energy Authority, Risley (England).
GEAR-CUTTING TOOLS MADE OF ULTRA HIGH SPEED STEEL COATED WITH TIN
25 Mar. 1985 10 p Transl. into ENGLISH from Utensil (Italy), v. 6, no. 4, Apr. 1984 p 79-82
(BLL-Risley-Tr-5109-(9091.9F)) Avail: British Library Lending Div., Boston Spa, England

In the field of high speed and ultra high speed steel tools for gear cutting, antiwear coatings of titanium nitride (TiN) represent one of the more recent developments: the combination of a fairly tough base material with a surface coating highly resistant to wear ensures - generally speaking - a conspicuous increased saving on the machining, because it permits the maintenance of a high rate of cutting together with a long life of the tools and produces a high grade finish on the teeth of the gears produced. Experience collected up to now regarding tools treated in this way does, however, show a rather marked diversity: under equal nominal conditions, various users report very different figures for the life of the tool. The various reasons for this deviation have not yet been fully and precisely recorded: the opinion of experts is, however, that it can be attributed to small but significant differences in carrying out the treatment by which the coating of titanium nitride is applied to the tool. G.L.C.

N85-25838 Illinois Univ., Chicago.
MANIPULATION AND SIMULATION OF GENERAL ROBOTS USING THE ZERO-POSITION DESCRIPTION Ph.D. Thesis
Kazem S. M. Kazerounian 1984 323 p
Avail: Univ. Microfilms Order No. DA8501244

Two different iterative schemes are developed to solve the inverse kinematics problem of freedom industrial robots. Application of the zero-position method is extended to the dynamic analysis of the manipulators. A general purpose computer program MASP (Manipulator Analysis and Simulation Package) is developed to solve the problems of direct and inverse kinematics and dynamics of the manipulators. MASP utilizes the aforementioned kinematic and dynamic analysis methods. It is used then to solve several numerical examples. A manipulation theory which does not require the solution of the problems of inverse kinematics and dynamics is also developed. This direct velocity control technique is based upon an approximate estimation of driving forces (or torques) of the actuators by monitoring linear and velocities of the hard. The simulation part of MASP is used to test the above mentioned manipulation method. It is demonstrated that actuator forces estimated by the Direct Velocity Control technique generate a reasonable smooth and accurate movement of the hand from its current position to the target position. Dissert Abstr.

N85-25839 British Aerospace Dynamics Group, Bristol (England). Mechanical Equipment Dept.
LOCKING OF AUTOMATIVE PRODUCTS HYDRAULIC SELECTOR VALVES
C. L. Ames 7 Apr. 1982 7 p
(BAe-Exper.Note-459) Copyright. Avail: Issuing Activity

Locking tests were performed after faults on the Tracked Rapier Goalpost raising mechanism and the trundling locks associated with the solenoid selector valves were traced to overtightening of the mounting bolts. Tests to determine whether loctite can be used to lock bolts in a hydraulic assembly subjected to oil contamination; and if 4 Nm torque (manufacturer's specification) is sufficient to avoid leaks without causing the spool to jam were carried out. Test results up to 10 Nm are given. Author (ESA)

N85-25840*# Rhode Island Univ., Kingston. Dept. of Mechanical Engineering.
DEVELOPMENT OF ROBOTS AND APPLICATION TO INDUSTRIAL PROCESSES Final Technical Report
William J. Palm and Ramiro Liscano 1984 30 p refs
(Grant NAG1-173)
(NASA-CR-175754; NAS 1.26:175754) Avail: NTIS HC A03/MF A01 CSCL 13I

An algorithm is presented for using a robot system with a single camera to position in three-dimensional space a slender object for insertion into a hole; for example, an electrical pin-type termination into a connector hole. The algorithm relies on a control-configured end effector to achieve the required horizontal translations and rotational motion, and it does not require camera calibration. A force sensor in each fingertip is integrated with the vision system to allow the robot to teach itself new reference points when different connectors and pins are used. Variability in the grasped orientation and position of the pin can be accomodated with the sensor system. Performance tests show that the system is feasible. More work is needed to determine more precisely the effects of lighting levels and lighting direction. Author

N85-25841# Council for Scientific and Industrial Research, Pretoria (South Africa).
AN ANALYSIS OF THE ECONOMICS OF TURNING TITANIUM ALLOYS WITH POLYCRYSTALLINE DIAMOND TOOLS
A. G. Timcuk 1984 6 p refs Transl. into ENGLISH from Rezanie i Instr. (USSR), n. 24, 1980 p 35-38
Avail: NTIS HC A02/MF A01

Diamond grains from north Jakutija, whilst shown by X-ray structural analysis to contain admixtures of hexagonal modification of carbon-lonsdalite, and hence belonging broadly speaking to the carbonado class, cannot be regarded as typical carbonado - Orlov's Type X - and accordingly have been designated Type XI. Type XI carbonado grains were first reported in 1967 in north Jakutija river alluvia, when M A CUMAK and Z V BARTOSINSKII noted the unusual form of these grains and named them jakutite. However, the results of these detailed investigations were never published and the proposed designation failed to become established. Type XI polycrystalline diamond aggregate (= carbonado with lonsdalite-jakutite) has irregular grains ranging from opaque dark-grey to semi-opaque yellow, not greatly dissimilar to typical Brazilian carbonado (Type X) but with the XI grains presenting, in addition to irregular to rounded form, vestiges of hexagonal outline. G.L.C.

N85-25842# Council for Scientific and Industrial Research, Pretoria (South Africa).
CLASSIFICATION AND TYPES OF DIAMOND WEAR IN HONING
I. H. Cepoveckii 1984 8 p refs Transl. into ENGLISH from Rezanie i Instr. (USSR), n. 24, 1980 p 3-7
Avail: NTIS HC A02/MF A01

It is impossible to establish a full classification of diamond tool grains using optical microscopes alone. A complex method involving optical microscopes plus transparent films was used to arrive at a clear classification of diamond grains according to their participation in the working surfaces of the diamond tools as

determined by the actual surface area of a diamond abrasive tool making contact with the workpiece. G.L.C.

N85-25843# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
ABRASIVE CUTTING-OFF WHEEL
Rainer Willneff 1983 5 p Transl. into ENGLISH from West German Patent (Appl. no. DE10619A1)
Avail: NTIS HC A02/MF A01

A diamond-impregnated steel disk for cutting hard, sintered ceramic materials is provided with a number of radial slots which improve cooling and swarf removal. The slots may be inclined up to an angle of 30 deg. The number of slots and their depth depends on the diameter of the disc. The cutting time for a SiC-Si tube with such a slotted rim is reduced from 2 hr to 20 min. A.R.H.

N85-25844*# Hughes Space and Communications Group, El Segundo, Calif.
NASA WELDING ASSESSMENT PROGRAM Final Report
E. J. Stofel Dec. 1984 44 p refs
(Contract NAS7-918)
(NASA-CR-175682; JPL-9950-1069; NAS 1.26:175682) Avail: NTIS HC A03/MF A01 CSCL 13H

A long duration test has been conducted for comparing various methods of attaching electrical interconnects to solar cells for near Earth orbit spacecraft. Representative solar array modules have been thermally cycled for 36,000 cycles between -80 and +80 C on this JPL and NASA Lewis Research Center sponsored work. This test simulates the environmental stress of more than 6 years on a near Earth spacecraft as it cycles in and out of the Earth's shadow. Evaluations of the integrity of these modules were made by visual and by electrical examinations before starting the cycling and then at periodic intervals during the cycling tests. Modules included examples of parallel gap and of ultrasonic welding, as well as soldering. The materials and fabrication processes are state of the art, suitable for forming large solar arrays of spacecraft quality. The modules survived his extensive cycling without detectable degradation in their ability to generate power under sunlight illumination. Author

N85-25845*# TRW Space Technology Labs., Redondo Beach, Calif. Power and Electronics Hardware Lab.
NASA WELDING ASSESSMENT PROGRAM Final Test Report
R. E. Patterson Jan. 1985 31 p refs
(Contract NAS7-918)
(NASA-CR-175683; JPL-9950-1070; NAS 1.26:175683) Avail: NTIS HC A03/MF A01 CSCL 13H

A program was conducted to demonstrate the cycle life capability of welded solar cell modules relative to a soldered solar cell module in a simulated low earth orbit thermal environment. A total of five 18-cell welded (parallel gap resistance welding) modules, three 18-cell soldered modules, and eighteen single cell samples were fabricated using 2 x 4 cm silicon solar cells from ASEC, fused silica cover glass from OCLI, silver plated Invar interconnectors, DC 93-500 adhesive, and Kapton-Kevlar-Kapton flexible substrate material. Zero degree pull strength ranged from 2.4 to 5.7 lbs for front welded contacts (40 samples), and 3.5 to 6.2 lbs for back welded contacts (40 samples). Solar cell cross sections show solid state welding on both front and rear contacts. The 18-cell welded modules have a specific power of 124 W/kg and an area power density of 142 W/sq m (both at 28 C). Three welded and one soldered module were thermal cycle tested in a thermal vacuum chamber simulating a low earth orbit thermal environment. B.W.

N85-25846*# National Aeronautics and Space Administration, Washington, D. C.
INSTALLATION, MAINTENANCE AND OPERATING MANUAL FOR THE LUCAS-TYPE FUEL INJECTION SYSTEM OF THE 3 B ROTARY ENGINE
May 1985 23 p Transl. into ENGLISH of the book "Technical Guidance Data No. 18" Japan p 1-18 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77872; NAS 1.15:77872) Avail: NTIS HC A02/MF A01 CSCL 21A

The installation procedure, maintenance, adjustment and operation of a Lucas type fuel injection system for 13B rotary racing engine is outlined. Components of the fuel injection system and installation procedure and notes are described. Maintenance, adjustment, and operation are discussed. E.A.K.

N85-25847*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTAL STIFFNESS OF TAPERED BORE SEALS
David P. Fleming 1985 20 p refs Presented at the Design Eng. Tech. Conf., Cincinnati, 10-13 Sep. 1985; sponsored by ASME
(NASA-TM-86978; E-2515; NAS 1.15:86978) Avail: NTIS HC A02/MF A01 CSCL 11A

The stiffness of tapered-bore ring seals was measured with air as the sealed fluid. Static stiffness agreed fairly well with results of a previous analysis. Cross-coupled stiffness due to shaft rotation was much less than predicted. It is suggested that part of the disparity may be due to simplifying assumptions in the analysis; however, these do not appear to account for the entire difference observed. E.A.K.

N85-25848*# Transmission Research, Inc., Cleveland, Ohio.
THERMAL TRACTION CONTACT PERFORMANCE EVALUATION UNDER FULLY FLOODED AND STARVED CONDITIONS Interim Report
J. L. Tevaarwerk May 1985 132 p refs
(Contract DEN3-35)
(NASA-CR-168173; NAS 1.26:168173; IR-2) Avail: NTIS HC A07/MF A01 CSCL 13I

Ultra high speed traction tests were performed on two traction fluids commonly employed. Traction data on these fluids is required for purposes of traction drive design optimization techniques. To obtain the traction data, an existing twin disc traction test machine was employed. This machine was modified to accommodate the range of test variables. All the data reported was obtained under conditions of side slip, a technique whereby only low power levels are required to simulate real traction drive contacts. Theoretical traction predictions were performed for a representative number of curves that showed the influence of rolling velocity, of contact pressure and of aspect ratio. To establish the accuracy of the thermal model the predictions were performed ith increasing levels of independence of experimentally determined parameters. In the final resulting prediction only two non linear thermal parameters were used for the prediction of 15 different traction curves covering the entire range of variables as used in the investigation, with the exception of the influence of asperity traction. Comparison of these theoretical curves and corresponding experimental traces show very good agreement. Author

N85-25849# Naval Postgraduate School, Monterey, Calif.
EXPERIMENTAL STUDY OF THE EFFECT OF MOIST ENVIRONMENTS ON EPOXY RESIN CHOCKS M.S. Thesis
G. F. Wright Sep. 1984 79 p
(AD-A152052) Avail: NTIS HC A05/MF A01 CSCL 13/10

The widespread use of the epoxy resin chocks to support alignment critical machinery on Naval ships has been hampered by the lack of a material specification, installation procedures, and maintenance information. Experiments were conducted to determine the effect of moist, shipboard environments on the compressive strength of the chocks, both during and after the curing process. Various techniques to accelerate exposure effects were investigated. Results indicated precautions are necessary for curing in low temperature/high humidity environments. Elevated temperature immersions and humidity chamber exposure proved to be useful methods to accelerate the studied effects. GRA

N85-25850# California Univ., Livermore. Lawrence Livermore Lab.
SHAFT: INTERACTIVE SHAFT DESIGN PROGRAM

Thomas A. Cook 20 Dec. 1984 69 p
(Contract W-7405-eng-48)
(DE85-007333; UCID-30200-83-8) Avail: NTIS HC A04/MF A01

SHAFT is an interactive program to calculate shaft diameter, at one or more critical points on a steel shaft, required for proper operation in accordance with user-specified design criteria. The user also selects one of four different failure criteria for use by the program: Soderberg, Modified Goodman, Gerber parabolic, or Quadratic. As a first step, SHAFT calculates the bearing loads using the design approach. For systems without a graphics capability, SHAFT gives the user hard copy printout options for the final input and again for the computed final design parameters. An optional display (available for systems with a graphics package) shows the diagrams for moment, torque, and axial force along the length of the shaft. By observing these diagrams, the user can choose the points on the shaft for which the diameter is critical. DOE

N85-25851# Language Services, Knoxville, Tenn.
HERMETIC SEALING OF NONLUBRICATED GAS SEAL AND FRICTION CHARACTERISTICS, CHAPTER 7
[1985] 39 p Transl. into ENGLISH of rept. no. 128 Mechanical Engineering Inst., Japan p 64-80
(Contract DE-AC05-84OR-21400)
(DE85-006375; ORNL-tr-5183) Avail: NTIS HC A03/MF A01

The present research was conducted with the main objective of obtaining the basic knowledge necessary for developing external seals, in particular, the most frequently used piston rod seal. More specifically, the heretic sealing of gas and various characteristics of friction in rod packing under nonlubricated conditions and the condition of reciprocating movement. For packing, lip-shaped packing, which is most widely used in the condition of reciprocating movement, was adopted. Furthermore, for comparison purposes, the slipper seal, shaped like a piston ring and without a joint, was also used. In addition, in the case of the slipper sea, the characteristic in piston packing was also investigated. DOE

N85-25852# Los Alamos Scientific Lab., N. Mex.
AFFECT OF ANGLE OF INCIDENCE ON PLASMAS GENERATED DURING LASER WELDING
R. D. Dixon and G. K. Lewis 1984 8 p refs Presented at 1984 Intern. Conf. on Appl. of Lasers and Electrooptics, Boston, 12 Nov. 1984
(Contract W-7405-eng-36)
(DE85-005724; LA-UR-84-3808; CONF-8411100-4) Avail: NTIS HC A02/MF A01

Laser supported combustion waves (lscw's) can be generated and reach critical density. More critical density plasmas are formed as the angle of incidence approaches the normal. As the angle of incidence is increased the penetration increases. The vapor plume is seen to precess about the surface normal which indicates motion of the molten pool. The penetration increases correlate with fewer critical density plasmas implying that better photon conversion is obtained when the plasma is absorbing and not at the critical density. The radiation monitoring techniques provide data which correlates with penetration and thus are potential monitoring and control methods. DOE

N85-25329# Joint Publications Research Service, Arlington, Va.
COSMONAUTS REPORT ON SPACE WELDING AT CONFERENCE Abstract Only
In its USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 90 Transl. into ENGLISH from Rabochaya Gaz. (USSR), 19 Oct. 1984 p 3 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25330# Joint Publications Research Service, Arlington, Va.
PATON COMMENTS ON RESULTS OF SPACE WELDING TESTS Abstract Only
O. Gusev *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 91 Transl. into ENGLISH from Pravda (USSR), 5 Nov. 1984 p 3 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25364# Joint Publications Research Service, Arlington, Va.
RESOURCES FOR ROBOTICS RESEARCH IN EUROPE, BY COUNTRY
Pierre Iticsohn *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-014) 7 May 1985 p 31-58 Transl. into ENGLISH from Ind. et Tech. (Paris), Dec. 1984 p 41, 42 and 44 (For primary document see N85-25362 15-12)
Avail: NTIS HC A05/MF A01

N85-25416# Joint Publications Research Service, Arlington, Va.
DIFFUSION VACUUM WELDING Abstract Only
V. Volodin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 45-50 Transl. into ENGLISH from Znaniye-Sila (Moscow), no. 11, Nov. 1984 p 17-18 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25417# Joint Publications Research Service, Arlington, Va.
WAYS OF IMPROVING LEVEL AND STABILITY OF MECHANICAL CHARACTERISTICS OF DIFFUSION-WELDED JOINTS OF OT4 TITANIUM ALLOY Abstract Only
V. V. Peshkov and V. N. Rodionov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 53 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 11, Nov. 1984 p 39-43 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25418# Joint Publications Research Service, Arlington, Va.
RESIDUAL OXYGEN PRESSURE IN CONTACT GAP UPON DIFFUSION WELDING OF TITANIUM Abstract Only
V. V. Peshkov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 53 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 11, Nov. 1984 p 6-7 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25419# Joint Publications Research Service, Arlington, Va.
BRITTLE FRACTURE RESISTANCE OF ELECTRON BEAM-WELDED JOINTS IN TITANIUM ALPHA ALLOYS Abstract Only
F. G. Gonserovskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 54 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 12, Dec. 1984 p 4-5 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25420# Joint Publications Research Service, Arlington, Va.
INCREASING SEAM FORMATION STABILITY IN ELECTRON BEAM WELDING OF VERY THICK TITANIUM ALLOYS Abstract Only
N. A. Olshanskiy, A. P. Lopatko, and N. P. Tolokonnikov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 54-55 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 12, Dec. 1984 p 1-2 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25421# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF COATING FOR PROTECTION OF BACKSIDE OF SEAM IN WELDING OF TITANIUM ALLOYS Abstract Only
B. Yu. Mozeyko, V. V. Bazhenov, and I. Ya. Degytarev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 55 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 12, Dec. 1984 p 22-24 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25422# Joint Publications Research Service, Arlington, Va.
STRUCTURE AND MECHANICAL PROPERTIES OF DISPERSION-HARDENED NICKEL ALLOY JOINTS WELDED BY DIFFUSION Abstract Only
E. S. Karakozov, A. P. Ternovskiy, T. S. Samsonova, E. V. Davidyan,

and B. N. Babich *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 56 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 11, Nov. 1984 p 15-17 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25423# Joint Publications Research Service, Arlington, Va.
STUDY OF EXPERIMENTAL ROBOTIZED SYSTEM FOR ARC WELDING BASED ON UNIVERSAL-15 MANIPULATOR Abstract Only
V. A. Timchenko, A. I. Bondarenko, S. V. Dubovetskiy, V. N. Skorina, A. Yu. Kargashin, and V. E. Bulatov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 56 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 11, Nov. 1984 p 33-38 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25424# Joint Publications Research Service, Arlington, Va.
DYNAMIC CHARACTERISTICS OF ac ARC IN WELDING ALUMINUM ALLOYS Abstract Only
G. M. Korotkova *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 57 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 11, Nov. 1984 p 30-32 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25426# Joint Publications Research Service, Arlington, Va.
PRESSURE WELDING OF CORROSION-RESISTANT STEEL WITH AMg6 ALUMINUM Abstract Only
V. D. Saprygin, V. I. Sokolov, Ye. V. Onosovskiy, E. S. Karakozov, and V. I. Zotin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 58 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 12, Dec. 1984 p 10-12 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25427# Joint Publications Research Service, Arlington, Va.
EFFECTIVENESS OF USE OF HEAT-DISSIPATING CLAMPS TO REDUCE DEFORMATION DURING ARGON ARC WELDING OF THIN SHEETS OF AMg6 ALLOY Abstract Only
I. M. Zhdanov, B. V. Medko, V. V. Lysak, V. N. Nifantov, and S. L. Dykhno *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 59 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 12, Dec. 1984 p 43-45 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25429# Joint Publications Research Service, Arlington, Va.
CONTACT POINT AND SEAM WELDING OF HEAT-RESISTANT ALLOYS Abstract Only
V. M. Shornikov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 62 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 12, Dec. 1984 p 8-10 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25430# Joint Publications Research Service, Arlington, Va.
THERMOCOMPRESSION WELDING OF PARTS MADE FROM AMts AND VT1 ALLOYS Abstract Only
Ye. L. Mamutov and E. A. Tikhomirov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 62-63 Transl. into ENGLISH from Svarchnoye Proizv. (Moscow), no. 7, Jul. 1984 p 27-29 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25431# Joint Publications Research Service, Arlington, Va.
MECHANICAL PROPERTIES OF WELDED JOINTS OF 1201 ALUMINUM ALLOY Abstract Only
V. I. Ryazantsev, Yu. I. Tolkachev, A. S. Roshchina, and R. G. Olkhovick *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 63 Transl. into ENGLISH from Svarochnoye pro Zvodstvo (Moscow), no. 7, Jul. 1984 p 29-30 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25553# Joint Publications Research Service, Arlington, Va.
MBB USES NEW CFC FORM TOOL FOR TITANIUM ALLOY AIR INTAKE
In its West Europe rept.: Sci. and Technol. (JPRS-WST-84-012) 18 Apr. 1984 p 1-2 Transl. into ENGLISH from VDI Nachrichte (Dusseldorf), 2 Mar. 1984 p 20 (For primary document see N85-25552 15-31)
Avail: NTIS HC A04/MF A01

N85-25555# Joint Publications Research Service, Arlington, Va.
FRENCH ROBOTICS RESEARCH AT GRENOBLE LABS
Jean-Claude Hanus *In its* West Europe rept.: Sci. and Technol. (JPRS-WST-84-012) 18 Apr. 1984 p 32-36 Transl. into ENGLISH from Micro et Robots (Paris), Mar. 1984 p 8-12 (For primary document see N85-25552 15-31)
Avail: NTIS HC A04/MF A01

N85-25556# Joint Publications Research Service, Arlington, Va.
FRENCH FIRM DEVELOPS NEW KIND OF CTD CAMERA FOR ROBOTS
In its West Europe rept.: Sci. and Technol. (JPRS-WST-84-012) 18 Apr. 1984 p 40-41 Transl. into ENGLISH from AFP Sciences (Paris), 23 Feb. 1984 p 73 (For primary document see N85-25552 15-31)
Avail: NTIS HC A04/MF A01

N85-25561# Joint Publications Research Service, Arlington, Va.
PRODUCTION CELLS WITH IR 2SO ROBOT EXAMINED
In its East European Rept.: Sci. and Technol. (JPRS-ESA-85-010) 11 Mar. 1985 p 79-85 Transl. into ENGLISH from Fertigungstechnik und Betrieb (Berlin, East Germany), v. 34, no. 9, Sep. 1984 p 567-569 (For primary document see N85-25560 15-31)
Avail: NTIS HC A07/MF A01

N85-25599# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF ROBOTS, ROBOTICS DISCUSSED
Zhu Jianying *In* China Rept.: Sci. and Technol. (JPRS-CST-85-009) 9 Apr. 1985 p 92-110 refs Transl. into ENGLISH from Ziran Zazhi (Shanghai), no. 9, 1984 p 655-662 (For primary document see N85-25596 15-31)
Avail: NTIS HC A08/MF A01

N85-25604# Joint Publications Research Service, Arlington, Va.
PSA, RENAULT WORK ON ALL FUEL AUTOMOBILE ENGINE
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-007) 21 Feb. 1984 p 12 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 12 Jan. 1984 p 11 (For primary document see N85-25600 15-31)
Avail: NTIS HC A03/MF A01

N85-25605# Joint Publications Research Service, Arlington, Va.
ROBOT USE IN FRG INCREASES BUT SENSOR TECHNOLOGY LAGS
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-007) 21 Feb. 1984 p 30 Transl. into ENGLISH from VDI Nachr. (Duesseldorf) 6 Jan. 1984 p 1 (For primary document see N85-25600 15-31)
Avail: NTIS HC A03/MF A01

N85-25642# Joint Publications Research Service, Arlington, Va.
FRENCH CONSULTING FIRM DEVELOPS OWN ROBOTICS
Andre Larane *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-009) 21 Mar. 1984 p 40-42 Transl. into ENGLISH from Ind. et Tech. (Paris), 10 Oct. 1983 p 23-26 (For primary document see N85-25639 15-31)
Avail: NTIS HC A04/MF A01

N85-25643# Joint Publications Research Service, Arlington, Va.
ITALY INVENTS ROBOT TO COMPETE WITH ASEA, HITACHI
Carlo Arcari *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-009) 21 Mar. 1984 p 43-44 Transl. into ENGLISH from Mondo Economico (Milan), 3 Nov. 1983 p 68-69 (For primary document see N85-25639 15-31)
Avail: NTIS HC A04/MF A01

N85-25650# Joint Publications Research Service, Arlington, Va.
ITALY'S FIAT USES SWEDEN'S ASEA SEEING ROBOT
C. Ar *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-014) 4 May 1984 p 35-36 Transl. into ENGLISH from Mondo Economico (Milan), 22 Mar. 1984 p 73 (For primary document see N85-25647 15-31)
Avail: NTIS HC A04/MF A01

N85-25659# Joint Publications Research Service, Arlington, Va.
PROCESS CONTROL SYSTEMS FOR LARGELY AUTOMATED MANUFACTURING
W. Fritzsch, D. Kochan, J. Schaller, and H. J. Zander *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 14-32 refs Transl. into ENGLISH from Messen Steuern Regeln (East Berlin), v. 27, no. 10, 1984 p 434-439 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

N85-25661# Joint Publications Research Service, Arlington, Va.
APPLICATIONS, SPECIFICATIONS OF ROBOTRON CAD-CAM WORK STATIONS
Herbert Willem and Peter Kuntsche *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 54-66 refs Transl. into ENGLISH from Messen Steuern Regeln (East Berlin), v. 27, no. 10, 1984 p 446-449, 457 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

N85-25662# Joint Publications Research Service, Arlington, Va.
SOVIET INSTITUTE DIRECTOR ON GDR-USSR WELDING TECHNOLOGY
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 67-69 Transl. into ENGLISH from Volksstimme (Madgeburg, East Germany), 29 Dec. 1984 p 4 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

N85-25663# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL ASPECT OF WELDING TECHNOLOGY RESEARCH DISCUSSED
Matthias Schlegel *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 70-72 Transl. into ENGLISH from Neue Zeit (East Berlin), 14 Jul. 1984 p 7 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

N85-25664# Joint Publications Research Service, Arlington, Va.
APPLICABILITY OF MODULAR VERSUS UNIVERSAL ROBOTS DISCUSSED
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-018) 10 May 1985 p 73-76 Transl. into ENGLISH from Wochenpost (East Berlin), no. 33, 17 Aug. 1984 p 17 (For primary document see N85-25658 15-31)
Avail: NTIS HC A06/MF A01

N85-25872*# Textron Bell Aerospace Co., Buffalo, N. Y.
AN UNUSUAL APPLICATION OF NASTRAN CONTOUR PLOTTING CAPABILITY
S. Mittal, M. Gallo, and T. Wang *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 164-171 ref (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

N85-25888*# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Nuclear Survivability Group.
NASTRAN ANALYSIS COMPARISON TO SHOCK TUBE TESTS USED TO SIMULATE NUCLEAR OVERPRESSURES
T. K. Wheless *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 389-418 Previously announced as N84-30337 (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N85-25853*# TRW Space Technology Labs., Redondo Beach, Calif. Federal Systems Div.
NONDESTRUCTIVE EQUIPMENT STUDY Final Report
25 Jan. 1985 43 p
(Contract NAS9-17101)
(NASA-CR-171865; NAS 1.26:171865; DRL-RA-509T) Avail: NTIS HC A03/MF A01 CSCL 14D

Identification of existing nondestructive evaluation (NDE) methods that could be used in a low Earth orbit environment; evaluation of each method with respect to the set of criteria called out in the statement of work; selection of the most promising NDE methods for further evaluation; use of selected NDE methods to test samples of pressure vessel materials in a vacuum; pressure testing of a complex monolythic pressure vessel with known flaws using acoustic emissions in a vacuum; and recommendations for further studies based on analysis and testing are covered. Author

N85-25854# United Kingdom Atomic Energy Authority, Harwell (England). Materials Physics and Metallurgy Div.
AN AMPLITUDE CORRELATION AND DIFFERENCING METHOD FOR THE MONITORING OF FLAWS IN REPEAT ULTRASONIC INSPECTIONS
S. F. Burch Jan. 1985 27 p refs
(AERE-R-11416) Avail: NTIS HC A03/MF A01

An amplitude correlation and differencing (ACD) method for the detection of the flaw change using digital pulse-echo ultrasonic data is proposed. The ACD method is based on statistical analysis, using a computer, of digitised pulse amplitudes from scans of the same transducer recorded during two separate ultrasonic inspections. Changes in flaws with a wide variety of sizes and other characteristics can be detected, provided the change is in a direction perpendicular to the center line of the ultrasonic beam. Practical experience of this method was gained by analysis of ultrasonic data from two inspections of a weld, separated by a year. The effectiveness of the ACD method for flaw monitoring was compared with that of the 6dB dropp sizing method, before and after resolution improvement by the synthetic aperture focussing technique (SAFT). Author

N85-25855# United Kingdom Atomic Energy Authority, Harwell (England). Theoretical Physics Div.
SIZING CAPABILITY OF AUTOMATED ULTRASONIC TIME-OF-FLIGHT DIFFRACTION IN THICK SECTION STEEL AND ASPECTS OF RELIABLE INSPECTION IN PRACTICE
J. A. G. Temple Nov. 1984 76 p refs Presented at the 3rd European Conf. on NDT, Florence, 15-18 Oct. 1984
(AERE-R-11548) Avail: NTIS HC A05/MF A01

Several aspects of the reliability of ultrasonic inspection are discussed. The basis is laid for the continuing development of models of current ultrasonic reliability which can be used in assessments of the failure probability of pressure vessels. Some general points are made, for example on the difficulties inherent in test block trials and on the likelihood of human error; and specific points are made about the Harwell Time-of-Flight Diffraction results in a particular test block trial. One of the general comments concerns the number of defects required in test block trials for various levels of statistical confidence. The specific case of the defect detection trials is considered to show that it is possible to manufacture realistic defects accurately, and to highlight the difficulty of carrying out a destructive examination to the same accuracy as can be obtained with some ultrasonic techniques. The role of theoretical modelling studies is discussed in terms of which defects cause most concern in terms of pressure vessel integrity, and the optimization of ultrasonic inspection techniques. These general comments are supported by specific reference to

work carried out on the Harwell Time-of-Flight Diffraction technique. Results obtained with the Harwell implamentation of the Time-of-Flight Diffraction technique in a recent test block trial are presented and compared with other, currently employed, ultrasonic techniques of defect size measurement. R.J.F.

N85-25856# United Kingdom Atomic Energy Authority, Harwell (England). Materials Physics and Metallurgy Div.
LASER-BASED NON-DESTRUCTIVE TESTING TECHNIQUES FOR THE ULTRASONIC CHARACTERIZATION OF SUB-SURFACE FLAWS
A. M. Aindow, R. J. Dewhurst, S. B. Palmer, and C. B. Scruby Jan. 1985 23 p refs Prepared in cooperation with Hull Univ., UK
(AERE-R-11562) Avail: NTIS HC A02/MF A01

Laser generation and detection of ultrasound has been used for remote characterization of flat bottomed holes, simulating subsurface flaws, drilled into an aluminium test sample. A pulsed Nd:YAG laser system was used to generate the subsequent surface displacements. The technique allows both the width and depth of flaws to be assessed. An analysis of the data shows that the method is particularly suited to detection of flaws less than 4 mm below the surface of the sample, a region which is difficult to inspect by conventional contact ultrasonic technique. Author

N85-25857# City Univ., London (England). Dept. of Mathematics.
APPROXIMATING POSTERIOR DISTRIBUTIONS OF SYSTEM RELIABILITY DERIVED FROM COMPONENT TEST DATA Final Technical Report
A. Winterbottom Oct. 1984 66 p
(Contract DAJA37-82-C-0736; DA Proj. 1T1-61102-BH-57)
(AD-A152057) Avail: NTIS HC A04/MF A01 CSCL 12/1

The determination of exact interval estimates for system reliability, when only the components of the system have been tested, is difficult both from a theoretical and a computational point of view. This work develops approximations to exact Bayesian intervals using asymptotic expansions and other techniques. Several approximations prove to be very accurate, especially in the region where computation of exact results becomes formidable. The assessment of accuracy is by comparison with exact results, when these are available. For systems with complex structure comparisons are with results obtained by simulating the posterior distribution of system reliability using Monte Carlo methods. Test data considered can be either pass/fail or data obtained from procedures for which failure times are exponentially distributed. Mixed test data and repeated components are also considered. GRA

N85-25858# Westinghouse Hanford Co., Richland, Wash.
SYSTEM FOR NDH OF THERMAL SPRAY COATING BONDS
D. R. Green, C. R. Wandling, F. B. Gatto (Puget Sound Naval Shipyard), and F. S. Rogers (Puget Sound Naval Shipyard) Sep. 1984 32 p Presented at the American Society for Metals Meeting, Long Beach, Calif. 31 Oct. 1984
(Contract DE-AC06-76FF-02170)
(DE85-007463; HEDL-SA-2783-FP; CONF-8410238-1) Avail: NTIS HC A03/MF A01

A nondestructive testing system that is especially well suited to NDE of bonds between coatings and substrates was developed. Heat is injected into the test specimen surface from a hot gas pulse and detects coating problems by means of an emissivity independent infrared scanning method. This method is very practical and was proven in numerous demonstrations. It is the only method known to be applicable to such a wide variety of coatings. Qualitative correlation between bond strength and scan results from the system was demonstrated on one small group of test specimens. Due to its emissivity independence, the method yields results that are, in many cases, far superior to other infrared-thermal NDE methods. It can be applied to coatings having tough surfaces, and no physical contact with the test specimen is required. DOE

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N85-25859 Pennsylvania State Univ., University Park.
ON RESIDUAL STRESSES AND STRESS INTENSITY FACTORS IN COMPOSITE MATERIALS Ph.D. Thesis
Peter J. Fritz 1984 111 p
Avail: Univ. Microfilms Order No. DA8429079

Analyses are presented for the calculation of residual stresses generated in an isolated spherical inclusion metal matrix composite. The interfacial contact pressures and plastic zone sizes for various cooling rates imposed on an alumina sphere embedded in a cast aluminum alloy are evaluated. The results show that stress relaxation and alloy viscosity are important factors affecting the final composite residual stress state. Elastic residual stresses in multiple-reinforcement composites are measured photoelastically, with stiff cylinders in compliant photoelastic plates. The cylinders are positioned in the photoelastic samples to measure the influence of volume fraction and reinforcement configurations. Stress intensity factors are measured photoelastically for cracks in flat plates loaded by a solitary force-fitted cylindrical inclusion. The stress intensity factors are characterized for a range of matrix-inclusion interfacial pressures and inclusion to crack tip distances. An isolated-reinforcement composite with an artificial crack is subjected to fluctuating applied stress. A theoretical crack growth rate is determined. Dissert. Abstr.

N85-25860 Maryland Univ., College Park.
ON RAYLEIGH WAVES AND RAYLEIGH WAVE EXTENSION OF SURFACE MICRO-CRACKS Ph.D. Thesis
Jaime Fernando Cardenas-Garcia 1983 309 p
Avail: Univ. Microfilms Order No. DA8429911

The extension of surface micro-cracks induced by the action of a surface or Rayleigh wave is examined both theoretically and experimentally. The original Rayleigh solution for a surface wave propagating in a homogeneous, isotropic, elastic, two-dimensional material, for the cases of plane strain and plane stress is reappraised. As a refinement to this approach the full-field solution by Lamb is also reconsidered. To obtain a view of the entire field of interest and to compare the Rayleigh and Lamb results, the theoretically predicted isochromatic patterns associated with a propagating Rayleigh wave in two-dimensions are generated. Using the Griffith-Irwin energy release rate fracture criterion for cracks under combined Mode I and Mode II loading, a prediction is made of the path and final length of the surface micro-crack extension produced by the Rayleigh wave. Predictions of the crack extension direction are also obtained using the maximum normal stress fracture criterion. Dynamic photoelasticity is used to observe the isochromatic patterns associated with a Rayleigh wave propagating along the narrow edge of a transparent, birfringent plate. The process of crack extension due to a Rayleigh wave is examined. Dissert. Abstr.

N85-25861 Purdue Univ., Lafayette, Ind.
REFLECTION AND TRANSMISSION OF FLEXURAL WAVES AT DISCONTINUITIES Ph.D. Thesis
Sudhir Kamle 1984 155 p
Avail: Univ. Microfilms Order No. DA8500391

The behavior of flexural waves in the presence of structural discontinuities such as angle joints is investigated. A model of a rigid joint with a finite mass is developed to study the reflection and transmission of flexural waves. A fast fourier transform (FFT) computer algorithm is used to characterize the dispersive flexural waves. Having first characterized the incident wave it is then propagated through different types of discontinuities namely, a stepped beam, a free end of a beam, a T joint and an angle joint. The effect of joint mass on the flexural wave behavior is studied for the case of a stepped beam and a T beam. Comparison

with experimental results are presented for the case of a stepped beam, a free end beam and a T joint. Dissert. Abstr.

N85-25862 Oregon State Univ., Corvallis.
FATIGUE LIFE, FATIGUE CRACK PROPAGATION AND FRACTURE TOUGHNESS STUDY OF 7075 ALUMINUM ALLOY SUBJECTED TO THERMOMECHANICAL PROCESSING Ph.D. Thesis
Moon Hee Lee 1984 165 p
Avail: Univ. Microfilms Order No. DA8500998

In the T6 condition, 7075 aluminum alloy has relatively low fatigue strength and low fracture toughness. Thermomechanical processing, including pre-cyclic loading and stretching at high and ambient temperatures, was investigated with the aim of improving these properties. Fatigue life tests show that all four thermomechanical processes investigated increase the fatigue life at low stress levels, but cause a reduction at high stress levels. The fatigue crack propagation rate of the allow with a wide precipitation free zone (PFZ) was approximately the same as that of the alloy with a narrow PFZ under similar conditions of cyclic loading. The alloy with the wide PFZ demonstrated a greater value of fracture toughness than that shown by the alloy with the narrow PFZ. Transmission electron microscopy shows that a large number of dislocations are generated within the soft PFZ areas as a result of the cyclic pre-loading. Scanning electron microscopy shows an intergranular fracture mode for the alloy with the narrow PFZ and a simple rupture mode for the alloy with the wide PFZ.
Dissert. Abstr.

N85-25863*# Computer Software Management and Information Center, Athens, Ga.
THIRTEENTH NASTRAN USERS' COLLOQUIUM
May 1985 469 p refs Colloq. held in Boston, 6-10 May 1985
Original contains color illustrations
(NASA-CP-2373; NAS 1.55:2373) Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

The application of finite element methods in engineering is discussed and the use of NASTRAN is compared with other approaches. Specific applications, pre- and post-processing or auxiliary programs, and additional methods of analysis with NASTRAN are covered. For individual titles, see N85-25864 through N85-25891.

N85-25864*# Sperry Systems Management, Huntsville, Ala.
NEW ENHANCEMENTS IN APRIL 85 NASTRAN RELEASE
Gordon C. Chan *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 1-30 (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

Several features were added to COSMIC NASTRAN, along with some enhancements to improve or update existing capabilities. Most of these additions and enhancements were provided by industry users to be incorporated into NASTRAN for wider use. DIAG 48 provides a synopsis of significant developments in past NASTRAN releases (1983-1985) and indexes all diagnostic output messages and operation requests (DOMOR). Other features include: volume and surface computation of the 2-D and 3-D elements, NOLIN5 input and; NASTRAN PLOTOPT-N (where N = 2, 3, 4, or 5); shrink element plots; and output scan. A nonprint option on stress and force output request cards was added. Automated find and nofind options on the plot card, fully stressed design, high level plate elements, eigenvalue messages, and upgrading of all FORTRAN source code to the ANSI standard are enhancements made. A.R.H.

N85-25865*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMPROVED ACCURACY IN SOLID ISOPARAMETRIC ELEMENTS USING SELECTIVELY REDUCED INTEGRATION Abstract Only **c39**
W. R. Case, R. S. Mitchell, and R. E. Vandegrift *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 31 (For primary document see N85-25863 15-37)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

Currently COSMIC NASTRAN uses the same Gaussian integration order for every term in the stiffness matrix of the solid isoparametric elements. This results in overly stiff elements under some conditions. A modification to the CIHEXI, CIHEX2 and CIHEX3 elements is described which provides the user with the capability of controlling the order of integration for selected terms in the stiffness matrix. Examples of improved accuracy using selectively reduced integration be provided are provided. Author

N85-25866*# Anamet Labs., Inc., San Carlos, Calif.
CRACK ELEMENTS FOR COSMIC/NASTRAN
P. J. Woytowitz and R. L. Citerley *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 32-46 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

A crack element was developed and incorporated into COSMIC/NASTRAN. The element is considered linear, isotropic, and homogeneous. Mode 1 and 2 stress intensity factors are automatically calculated. Comparisons to theoretical plane strain solutions for several geometries are presented and demonstrate the accuracy of the developed element. Extensions of the element to three dimensions, anisotropic material, and plastic analysis are discussed. Author

N85-25867*# Rockwell International Corp., El Segundo, Calif.
A 4-NODE BILLINEAR ISOPARAMETRIC ELEMENT IN ROCKWELL NASTRAN
C. Liao and R. E. Allison *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 47-66 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A10/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

The development and evaluation of the Rockwell NASTRAN four node quadrilateral (QUAD4) element is presented. The element derivation utilizes bilinear isoparametric techniques both for membrane and bending characteristics. The QUAD4 element coordinate system, membrane properties, lumped mass matrix, and treatment of warping are based upon the COSMIC/NASTRAN QDMEMI element while the bending characteristics are based on a paper by T. J. R. Hughes. The effects of warping on the bending stiffness, consistent mass, and geometric stiffness are based upon a paper by R. H. MacNeal. Numerical integration is accomplished by Gaussian quadrature on a 2 x 2 grid. Practical user support features include variable element thickness, thermal analysis and layered composite material definitions. Author

N85-25868*# Computerized Structural Analysis and Research Corp., Northridge, Calif.
LAYERED COMPOSITE ANALYSIS CAPABILITY
R. Narayanaswami and J. G. Cole *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 67-109 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

Laminated composite material construction is gaining popularity within industry as an attractive alternative to metallic designs where high strength at reduced weights is of prime consideration. This has necessitated the development of an effective analysis capability for the static, dynamic and buckling analyses of structural components constructed of layered composites. Theoretical and user aspects of layered composite analysis and its incorporation into CSA/NASTRAN are discussed. The availability of stress and strain based failure criteria is described which aids the user in reviewing the voluminous output normally produced in such analyses. Simple strategies to obtain minimum weight designs of composite structures are discussed. Several example problems are presented to demonstrate the accuracy and user convenient features of the capability. Author

N85-25869*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NPLOT: AN INTERACTIVE PLOTTING PROGRAM FOR NASTRAN FINITE ELEMENT MODELS
Gary K. Jones and Kelly J. McEntire *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 110-132 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

The NPLOT (NASTRAN Plot) is an interactive computer graphics program for plotting undeformed and deformed NASTRAN finite element models. Developed at NASA's Goddard Space Flight Center, the program provides flexible element selection and grid point, ASET and SPC degree of freedom labelling. It is easy to use and provides a combination menu and command driven user interface. NPLOT also provides very fast hidden line and haloed line algorithms. The hidden line algorithm in NPLOT proved to be both very accurate and several times faster than other existing hidden line algorithms. A fast spatial bucket sort and horizon edge computation are used to achieve this high level of performance. The hidden line and the haloed line algorithms are the primary features that make NPLOT different from other plotting programs. Author

N85-25870*# PDA Engineering, Santa Ana, Calif.
COSMIC/NASTRAN-PATRAN INTERFACE
Daron H. Libby *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 133-151 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

A three dimensional solid modeling and finite element pre and postprocessing program, PATRAN, uses the latest interactive computer graphics technology, provides a visual means to define a finite element model and its environment, and reviews its resultant model behavior. The capabilities provided by the PATRAN-COSMIC/NASTRAN interface are discussed. While the translator capabilities give some indication of the interface quality between the two programs, there are other attributes to be considered. The ideal interface would be a user transparent union of the two programs so that the engineer could move from one program to the other fluently and naturally. Hence, a valid assessment of the interface completeness must consider how close the current capabilities are to the idealized case. An example problem is presented to demonstrate how COSMIC/NASTRAN and PATRAN can be used together to meet the requirements of an actual engineering application. A.R.H.

N85-25871*# Naval Ship Research and Development Center, Bethesda, Md. Numerical Structural Mechanics Branch.
TWO INTERACTIVE GRAPHICS POSTPROCESSORS FOR NASTRAN
Robert R. Lipman *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 152-163 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

Two interactive computer graphics postprocessors, MAGGRAF and NASTEK, used for displaying NASTRAN-generated results are described. MAGGRAF is capable of displaying magnetic potentials or fields computed from results generated by a NASTRAN magnetostatic analysis. NASTEK is capable of displaying NASTRAN-generated PLT2 files on most Tektronic terminals. Examples of the plotting capabilities for each of the programs will be presented including plots of drawn with solid and dotted lines. Author

N85-25872*# Textron Bell Aerospace Co., Buffalo, N. Y.
AN UNUSUAL APPLICATION OF NASTRAN CONTOUR PLOTTING CAPABILITY c37
S. Mittal, M. Gallo, and T. Wang *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 164-171 ref (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

A procedure is presented for obtaining contour plots of any physical quantity defined on a number of points of the surface of a structure. Rigid Format 1 of HEAT approach in Cosmic NASTRAN is ALTERED to enable use of contour plotting capability for scalar quantities. The ALTERED DMAP sequence is given. Examples include temperature distribution on the face of a cooled laser mirror and the angle of incidence or a radome surface. A.R.H.

N85-25873*# Lehigh Univ., Bethlehem, Pa. Dept. of Mechanical Engineering and Mechanics.
ISOPARAMETRIC 3-D FINITE ELEMENT MESH GENERATION USING INTERACTIVE COMPUTER GRAPHICS
Cuneyd Kayrak and Tulga Ozsoy *In* NASA, Washington 13th NASTRAN Users Colloq. May 1905 p 172-176 refs Original contains color illustrations (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

An isoparametric 3-D finite element mesh generator was developed with direct interface to an interactive geometric modeler program called POLYGON. POLYGON defines the model geometry in terms of boundaries and mesh regions for the mesh generator. The mesh generator controls the mesh flow through the 2-dimensional spans of regions by using the topological data and defines the connectivity between regions. The program is menu driven and the user has a control of element density and biasing through the spans and can also apply boundary conditions, loads interactively. B.W.

N85-25874*# Textron Bell Aerospace Co., Buffalo, N. Y.
A NEW NASTRAN CAPABILITY FOR DATA REDUCTION
Michael Gallo and S. Mittal *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 177-187 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

A new module, MODB, for the data reduction of NASTRAN results is described. NASTRAN analysis results can be filtered and sorted for minimum/maximum values and the printed output resulting from large NASTRAN runs can be limited based on a number of available user options. The sorting is done on stresses, forces and vector quantities like displacements, velocity, and acceleration. The module can be accessed via DMAP alters to existing rigid formats, and has been used on a large number of statics and dynamics problems resulting in considerable savings in cost, time, and the amount of printing. Author

N85-25875*# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Nuclear Survivability Group.
AUTOMATIC DYNAMIC AIRCRAFT MODELER (ADAM) FOR THE COMPUTER PROGRAM NASTRAN
Hugh Griffis *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 188-198 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

Large general purpose finite element programs require users to develop large quantities of input data. General purpose pre-processors are used to decrease the effort required to develop structural models. Further reduction of effort can be achieved by specific application pre-processors. Automatic Dynamic Aircraft Modeler (ADAM) is one such application specific pre-processor. General purpose pre-processors use points, lines and surfaces to describe geometric shapes. Specifying that ADAM is used only for aircraft structures allows generic structural sections, wing boxes and bodies, to be pre-defined. Hence with only gross dimensions, thicknesses, material properties and pre-defined boundary conditions a complete model of an aircraft can be created. Author

N85-25876# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

CADS: A COMPUTER AIDED DESIGN SYSTEM c60
Victoria A. Tischler, Elizabeth M. Copenhaver, Michael C. Less (Rockwell International Corp., Los Angeles), and Susan Manuel (Rockwell International Corp., Los Angeles) *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 199-224 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 09B

CADS, a Computer Aided Design System, runs on the DEC VAX 11/780 minicomputer. The system supports six functional modules controlled by an Executive Monitor. All of these modules communicate with a data base through a data manager. The data base consists of 2 data files, one for model geometry and one for program output. CADS can be interfaced with relative ease with any given finite element program. The CADS modular organization and its capabilities are examined in detail. Several examples are used to illustrate its broad band of capabilities.
Author

N85-25877*# Anamet Labs., Inc., San Carlos, Calif.
RITZ PROCEDURE FOR COSMIC/NASTRAN
R. L. Citerley and P. J. Woytowitz *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 225-233 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

An analysis procedure has been developed and incorporated into COSMIC/NASTRAN that permits large dynamic degree of freedom models to be processed accurately with little or no extra effort required by the user. The method employs existing capabilities without the need for approximate Guyan reduction techniques. Comparisons to existing solution procedures presently within NASTRAN are discussed.
Author

N85-25878*# Textron Bell Aerospace Co., Buffalo, N. Y.
SYMMETRIC COMPOSITE LAMINATE STRESS ANALYSIS
T. Wang, K. F. Smolinski, and S. Gellin *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 234-244 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

It is demonstrated that COSMIC/NASTRAN may be used to analyze plate and shell structures made of symmetric composite laminates. Although general composite laminates cannot be analyzed using NASTRAN, the theoretical development presented herein indicates that the integrated constitutive laws of a symmetric composite laminate resemble those of a homogeneous anisotropic plate, which can be analyzed using NASTRAN. A detailed analysis procedure is presented, as well as an illustrative example. Author

N85-25879*# Hughes Tool Co., Torrance, Calif. Hughes Drilling Equipment.
ON THE INTERCONNECTION OF INCOMPATIBLE SOLID FINITE ELEMENT MESHES USING MULTIPOINT CONSTRAINTS
Gary L. Fox *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 245-272 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

Incompatible meshes, i.e., meshes that physically must have a common boundary, but do not necessarily have coincident grid points, can arise in the course of a finite element analysis. For example, two substructures may have been developed at different times for different purposes and it becomes necessary to interconnect the two models. A technique that uses only multipoint constraints, i.e., MPC cards (or MPCS cards in substructuring), is presented. Since the method uses only MPC's, the procedure may apply at any stage in an analysis; no prior planning or special data is necessary.
Author

N85-25880*# Georgia Univ., Athens. Dept. of Agricultural Engineering.
NASTRAN'S APPLICATION IN AGRICULTURAL ENGINEERING
Garrett L. VanWicklen *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 273-288 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

Finite element analysis has been recognized as a valuable solution method by agricultural engineers. NASTRAN has been obtained by the Agricultural Engineering Department at the University of Georgia. The NASTRAN Thermal Analyzer has been used in the teaching program for an undergraduate course in heat transfer and will be used for a new graduate course in finite element analysis. The NASTRAN Thermal Analyzer has also been applied to several research problems in the Agricultural Engineering Department.
Author

N85-25881*# John Deere Dubuque Works, Iowa.
USE OF COSMIC NASTRAN IN A DESIGN DEPARTMENT
Richard C. Coddington and Jose O. Nazatio *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 289-307 (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

Application of COSMIC NASTRAN to product development in a design department requires low cost, rapid model construction and interactive evaluation of results. The NASTRAN processor is described that meets these requirements by automating many of the modeling activities.
B.W.

N85-25882*# Clemson Univ., S.C. Dept. of Bioengineering.
AN ELASTIC ANALYSIS OF A PLATED BONE TO DETERMINE FRACTURE GAP MOTION
Francis W. Cooke and William M. Vannah *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 308-319 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

An elastic analysis to determine fracture gap motions occurring in the osteotomized and plated canine femur was performed using the finite element program NASTRAN. The femur was idealized as a hollow right cylinder, and transverse anisotropy was assumed for the elastic properties of the bone. A 3-D 360 degree model consisting of 224 isoparametric quadrilateral hexahedral and 11 beam elements was created. A range of plate stiffnesses was tested by varying the modulus of elasticity of the plate from 207 GPa to 1 GPA. Moments were applied in the plane of the plate, about the axis of the plate, and in the plane of the screws. Results showed that, for plates of typical geometry and elastic modulus under 10 GPa, the contribution to fracture gap motion occurring due to deformation in the bone was negligible compared to that contribution from deformation in the plate.
B.W.

N85-25883*# Gates Learjet Corp., Wichita, Kans.
LEARJET MODEL 55 WING ANALYSIS WITH LANDING LOADS
Robert R. Boroughs *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 320-346 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

The NASTRAN analysis was used to determine the impact of new landing loads on the Learjet Model 55 wing. These new landing loads were the result of a performance improvement effort to increase the landing weight of the aircraft to 18,000 lbs. from 17,000 lbs. and extend the life of the tires and brakes by incorporating larger tires and heavy duty brakes. Landing loads for the original 17,000 lb. airplane landing configuration were applied to the full airplane NASTRAN model. The analytical results were correlated with the strain gage data from the original landing load static tests. The landing loads for the 18,000 lb. airplane were applied to the full airplane NASTRAN model, and a comparison was made with the original Model 55 data. The results of this comparison enable Learjet to determine the difference in stress

distribution in the wing due to these two different sets of landing loads. E.A.K.

N85-25884*# Missouri Univ., Rolla.
FILLET WELD STRESS USING FINITE ELEMENT METHODS
Terry F. Lehnhoff and Gerald W. Green *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 341-363 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

Average elastic Von Mises equivalent stresses were calculated along the throat of a single lap fillet weld. The average elastic stresses were compared to initial yield and to plastic instability conditions to modify conventional design formulas is presented. The factor is a linear function of the thicknesses of the parent plates attached by the fillet weld. E.A.K.

N85-25885*# Lockheed-Georgia Co., Marietta.
THE STRUCTURAL FINITE ELEMENT MODEL OF THE C-5A
Gisela W. McClellan *In* NASA, Washington 13th NASTRAN Users Coll., May 1985 p 364-376 (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

A substructured NASTRAN model of the C-5A was analyzed for several different load conditions. The size of the model and the number of load cases used presented special problems in computer file and space management. This resulted in revisions to the in-house NASTRAN code. Despite the problems encountered the analyses were completed with excellent results. E.A.K.

N85-25886*# Naval Weapons Center, China Lake, Calif.
USING NASTRAN TO MODEL MISSILE INERTIA LOADS Abstract Only
Ron Marvin and Craig Porter *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 377 (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

An important use of NASTRAN is in the area of structural loads analysis on weapon systems carried aboard aircraft. The program is used to predict bending moments and shears in missile bodies, when subjected to aircraft induced accelerations. The missile, launcher and aircraft wing are idealized, using rod and beam type elements for solution economy. Using the inertia relief capability of NASTRAN, the model is subjected to various acceleration combinations. It is found to be difficult to model the launcher sway braces and hooks which transmit compression only or tension only type forces respectively. A simple, iterative process was developed to overcome this modeling difficulty. A proposed code modification would help model compression or tension only contact type problems. E.A.K.

N85-25887*# Butler Analyses, Towson, Md.
EXPERIENCE WITH FREE BODIES
T. G. Butler *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 378-388 (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

Some of the problems that confront an analyst in free body modeling, to satisfy rigid body conditions are discussed and with some remedies for these problems are presented. The problems of detecting these culprits at various levels within the analysis are examined. A new method within NASTRAN for checking the model for defects very early in the analysis without requiring the analyst to bear the expense of an eigenvalue analysis before discovering these defects is outlined. E.A.K.

N85-25888*# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Nuclear Survivability Group.
NASTRAN ANALYSIS COMPARISON TO SHOCK TUBE TESTS USED TO SIMULATE NUCLEAR OVERPRESSURES c37
T. K. Wheless *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 389-418 Previously announced as N84-30337 (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

This report presents a study of the effectiveness of the NASTRAN computer code for predicting structural response to nuclear blast overpressures. NASTRAN's effectiveness is determined by comparing results against shock tube tests used to simulate nuclear overpressures. Seven panels of various configurations are compared in this study. Panel deflections are the criteria used to measure NASTRAN's effectiveness. This study is a result of needed improvements in the survivability/vulnerability analyses subjected to nuclear blast. Author

N85-25889*# Naval Ship Research and Development Center, Bethesda, Md. Numerical Mechanics Div.
FINITE ELEMENT PREDICTION OF LOSS FACTORS FOR STRUCTURES WITH FREQUENCY-DEPENDENT DAMPING TREATMENTS
Gordon C. Everstine and Melvyn S. Marcus *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 419-430 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

A finite element procedure is described for calculating the loss factors for elastic structures to which frequency-dependent viscoelastic damping treatments were applied. The frequency dependence of the viscoelastic damping material is treated by approximating its shear modulus with a second-order polynomial so that the stiffnesses associated with the constant, linear, and quadratic terms can be combined, respectively, with the stiffness, damping, and mass matrices assembled for the rest of the structure. A single complex eigenvalue analysis is then performed in which the eigenvalues are purely imaginary. The loss factor is computed by the modal strain energy (MSE) approach. In the the MSE approach, the loss factor of a composite structure vibrating in one of its natural modes may be visualized as a weighted average of the loss factors of the component parts, with the relative stored energies as weighting constants. The finite element procedure, which can treat very general geometries, is illustrated for the case of a vibrating constrained-layer damped plate. E.A.K.

N85-25890*# Advanced Technology and Research, Inc., Burtonsville, Md.
DIRECT TRANSIENT ANALYSIS OF A FUZE ASSEMBLY BY AXISYMMETRIC SOLID ELEMENTS
Chung C. Dai, Jackson C. S. Yang, and John Titus (HDL, Adelphi, Md.) *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 431-452 Original contains color illustrations (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

A fuze assembly, which consists of three major parts, nose, collar and sleeve, was designed to survive severe transverse impact giving a maximum base acceleration of 20.000 G. It is shown that hoop failure occurred in the collar after the impact. They also showed that by bonding the collar to the nose, the collar was able to survive the same impact. To find out the effectiveness of the bonding quantitatively, axisymmetric solid elements TRAPAX and TRIAAX were used in modelling the fuze and direct transient analysis was performed. The dynamic stresses in selected elements on the bonded and unbonded collars were compared. The peak hoop stresses in the unbonded collar were found to be up to three times higher than those in the bonded collar. The NASTRAN results explained the observed hoop failure in the unbonded collar. In addition, static and eigenvalue runs were performed as checks on the models prior to the transient runs. The use of the MPCAX cards and the existence and contributors of the calculated first several nearly identical natural frequencies are addressed. E.A.K.

N85-25891*# Naval Ship Research and Development Center, Bethesda, Md. Numerical Mechanics Div.
TRANSIENT ANALYSIS OF A MAGNETIC HEAT PUMP
Erwin A. Schroeder *In* NASA, Washington 13th NASTRA Users Colloq. May 1985 p 453-462 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 20K

An experimental heat pump that uses a rare earth element as the refrigerant is modeled using NASTRAN. The refrigerant is a ferromagnetic metal whose temperature rises when a magnetic field is applied and falls when the magnetic field is removed. The heat pump is used as a refrigerator to remove heat from a reservoir and discharge it through a heat exchanger. In the NASTRAN model the components modeled are represented by one-dimensional ROD elements. Heat flow in the solids and fluid are analyzed. The problem is mildly nonlinear since the heat capacity of the refrigerant is temperature-dependent. One simulation run consists of a series of transient analyses, each representing one stroke of the heat pump. An auxiliary program was written that uses the results of one NASTRAN analysis to generate data for the next NASTRAN analysis. E.A.K.

N85-25892# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
DESIGN OF SHEAR DEFORMABLE ANTISYMMETRIC ANGLE-PLY LAMINATES TO MAXIMIZE THE FUNDAMENTAL FRENQUENCY AND FREQUENCY SEPARATION
S. Adali Dec. 1983 36 p refs Submitted for publication
(CSIR-TWISK-333) Avail: NTIS HC A03/MF A01

An antisymmetrically laminated angle-ply plate is optimized with the objectives of maximizing the fundamental eigenfrequency and the distance between two consecutive natural frequencies. The formulation includes the contribution of the shear deformation, but neglects the in-plane and rotary inertias. The design variables are the fiber orientation and the thicknesses of individual layers. The design problems are cast into a mathematical programming format and solved by using a quasi-Newton function maximization algorithm. A penalty function method is employed to maximize the fundamental frequency, subject to lower bound constraints on higher order frequencies. Numerical results are presented for laminates constructed of high modulus fibre reinforced materials, and the effects of various problem parameters on the efficiency of the designs are investigated. It is shown that the design variables may not be determined optimally if the effect of shear deformation is neglected. Moreover, it was observed that the classical plate theory leads to erroneous results in optimal material selection problems. Author

N85-25893*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VIBRATION AND BUCKLING OF ROTATING, PRETWISTED, PRECONED BEAMS INCLUDING COORIOLIS EFFECTS
K. B. Subrahmanyam and K. R. V. Kaza 1985 21 p refs Proposed for presentation at the 10th Bien. Design Eng. Conf. and Exhibit on Mech. Vibration and Noise, Cincinnati, 10-13 Sep. 1985; sponsored by ASME
(NASA-TM-87004; E-2310; NAS 1.15:87004) Avail: NTIS HC A02/MF A01 CSCL 20K

The effects of pretwist, precone, setting angle and Coriolis forces on the vibration and buckling behavior of rotating, torsionally rigid, cantilevered beams were studied. The beam is considered to be clamped on the axis of rotation in one case, and off the axis of rotation in the other. Two methods are employed for the solution of the vibration problem: (1) one based upon a finite-difference approach using second order central differences for solution of the equations of motion, and (2) based upon the minimum of the total potential energy functional with a Ritz type of solution procedure making use of complex forms of shape functions for the dependent variables. The individual and collective effects of pretwist, precone, setting angle, thickness ratio and Coriolis forces on the natural frequencies and the buckling boundaries are presented. It is shown that the inclusion of Coriolis effects is necessary for blades of moderate to large thickness ratios while these effects are not so important for small thickness ratio blades. The possibility of buckling due to centrifugal softening terms for large values of precone and rotation is shown. E.A.K.

N85-25894*# Akron Univ., Ohio. Dept. of Civil Engineering.
ON THERMOMECHANICAL TESTING IN SUPPORT OF CONSTITUTIVE EQUATION DEVELOPMENT FOR HIGH TEMPERATURE ALLOYS Final Report
David N. Robinson May 1985 32 p refs
(Grant NAG3-379)
(NASA-CR-174879; NAS 1.26:174879) Avail: NTIS HC A03/MF A01 CSCL 11F

Three major categories of testing are identified that are necessary to provide support for the development of constitutive equations for high temperature alloys. These are exploratory, charactrization and verification tests. Each category is addressed and specific examples of each are given. An extensive, but not exhaustive, set of references is provided concerning pertinent experimental results and their relationships to theoretical development. This guide to formulating a meaningful testing effort in support of consitutive equation development can also aid in defining the necessary testing equipment and instrumentation for the establishment of a deformation and structures testing laboratory. Author

N85-25895*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STRUCTURES AND DYNAMICS DIVISION RESEARCH AND TECHNOLOGY PLANS FOR FY 1985 AND ACCOMPLISHMENTS FOR FY 1984
Kay S. Bales Apr. 1985 102 p
(NASA-TM-86417; NAS 1.15:86417) Avail: NTIS HC A06/MF A01 CSCL 20K

The objectives, FY 1985 plans, approach, and FY 1985 milestones for the Structures and Dynamics Division's research programs are presented. The FY 1984 accomplishments are presented where applicable. This information is useful in program coordination with other government organizations in areas of mutual interest. E.A.K.

N85-25896*# Georgia Inst. of Tech., Atlanta.
ANALYSIS OF SHELL TYPE STRUCTURES SUBJECTED TO TIME DEPENDENT MECHANICAL AND THERMAL LOADING Semiannual Status Report, 15 Aug. 1984 - 14 Apr. 1985
George J. Simitses, R. L. Carlson, and R. Riff May 1985 4 p
(Grant NAG3-534)
(NASA-CR-175747; NAS 1.26:175747) Avail: NTIS HC A02/MF A01 CSCL 20K

A general mathematical model and solution methodologies for analyzing structural response of thin, metallic shell-type structures under large transient, cyclic or static thermomechanical loads is considered. Among the system responses, which are associated with these load conditions, are thermal buckling, creep buckling and ratchetting. Thus, geometric as well as material-type nonlinearities (of high order) can be anticipated and must be considered in the development of the mathematical model. G.L.C.

N85-25897# New South Wales Univ., Kensington (Australia). School of Metallurgy.
THE EFFECT OF OVERLOAD CYCLES ON FATIGUE CRACK PROPAGATION IN STRUCTURAL STEELS Ph.D. Thesis. Abstract Only
M. Drew 1984 3 p
Avail: NTIS HC A02/MF A01

A detailed study was made of the effect of a single peak overload cycle on the rate and mechanisms of fatigue crack propagation in two structural steels. A 100% overload cycle was imposed during crack growth at delta K sub b = 10 and 15 MPa square root of m, each at stress ratios (R) of 0.2 and 0.7. Additional tests were conducted at delta K sub b = MPa square root of m and R = 0.05. Compact tension test-pieces (B = 15 mm) of controlled rolled, cerium treated C-Mn and C-Mn-Nb-V steels were

used. The imposition of an overload cycle during constant amplitude crack growth caused a retardation of the subsequent crack growth, and the duration and extent of this retardation was affected by the values of delta K sub b, steel. Generally, the increment of crack growth that was affected by the overload cycle (a sub d) was about the same as the radius of the overload plastic zone and that predicted by the Wheeler-Willenborg model when crack growth occurred at R = 0.05 and 0.2. However, at R = 0.7, the values of a sub d were significantly smaller than either of these quantities. Author

N85-25898 Royal Aircraft Establishment, Farnborough (England).
THE EFFECT OF FRICTIONAL FORCES ON FATIGUE CRACK GROWTH IN LUGS
J. E. Moon Apr. 1984 52 p refs Presented at 12th Intern. Comm. on Aeron. Fatigue Symp., Toulouse, 25-27 May 1983
(AD-A151994; RAE-TR-84035; RAE-Mater/Struct-79; BR93481) Avail: NTIS HC A04/MF A01 CSCL 01/3

Crack propagation rate on lugs with normal clearance fit pins in which the frictional forces were reduced by lubricant and removed altogether from around the crack origin using pins with flats was measured. It is found that crack propagation rate at short crack lengths is significantly reduced by both measures, indicating values of stress intensity factor (delta k) nearer to those predicted ignoring frictional forces. It is found that the inclusion of the action of frictional forces in a fracture mechanics analysis of a lug leads to an increase in the predicted delta k at short crack lengths. Closer agreement with experimental results is obtained if it is assumed that these forces build up more in the region of the crack origin and are therefore effective for the important region of short crack lengths. Author (ESA)

N85-25899# Aeronautical Research Labs., Melbourne (Australia). Structures Div.
TENSILE AND FRACTURE TOUGHNESS PROPERTIES OF MIRAGE III SPARS
W. F. Lupson and J. Y. Mann Apr. 1984 17 p refs
(AR-003-019; ARL-STRUC-TM-376) Avail: NTIS HC A02/MF A01

Tensile and fracture toughness tests were conducted on specimens manufactured from the flange portions of the main spare of seven Mirage 3 wings. These have provided specific information relating to the mechanical properties of this component at locations close to where fatigue cracking occurred in service. Author

N85-25900# Texas A&M Univ., College Station. Dept. of Mathematics.
FRACTURE PROBLEMS IN POWER LAW VISCOELASTIC MATERIALS Final Report
Jay R. Walton Oct. 1984 7 p refs
(Grant AF-AFOSR-0152-82; AF Proj. 2304)
(AD-A149221; AFOSR-84-1099TR) Avail: NTIS HC A02/MF A01 CSCL 20/11

Several theoretical questions concerning contact and fracture phenomena for viscoelastic material are discussed. Specifically, the following topics are discussed: the dynamic, steady-state propagation of a semi-infinite crack in a general, isotropic and homogeneous linearly viscoelastic layer of finite thickness; the determination of the angular dependence of the stress field in the neighborhood of a dynamically propagating crack tip in linearly viscoelastic material; the quasi-static and steady-state sliding of a rigid indentor over a power-law inhomogeneous, linearly viscoelastic half-plane; and the quasi-static propagating of a semi-infinite, mode I crack in a power law inhomogeneous, linearly viscoelastic body. GRA

N85-25901# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics and Logistics Dept.
EFFECT OF INTERNAL PRESSURE ON FLEXIBILITY AND STRESS INTENSIFICATION FACTORS FOR PIPE ELBOWS ANALYZED BY THE FINITE ELEMENT METHOD Final Report
A. J. Quezon Dec. 1984 22 p
(AD-A151161; DTNSRDC/CMLD-84/19) Avail: NTIS HC A02/MF A01 CSCL 13/11

A finite element analysis using NASTRAN was conducted on a 90-degree piping elbow subjected to an inplane bending load and internal pressures of 0, 400, and 800 psi. The objective of this study was to verify that the nonlinear effect of the superposition of internal pressure with inplane bending could be accounted for by employing a static analysis with differential stiffness. Flexibility factors and stress intensification factors were computed from the NASTRAN results. These numerical data were then compared to similar data obtained from experimental results. The flexibility factors and stress intensification factors were computed from the NASTRAN results were found to agree reasonably well with the experimental data. The NASTRAN values tended to be conservative in that they slightly overestimated the flexibilities and stresses. These differences might be attributed to such experimental factors as nonuniform pipe wall thickness, spacing of strain gages, and bending of tangent straight pipe extensions. In general, it is concluded that the differential stiffness capability in NASTRAN is adequate for accounting for the effects of internal pressure on flexibility factors and stress intensification factors. GRA

N85-25902# Nebraska Univ., Lincoln. Coll. of Engineering and Technology.
ENTROPY PRODUCTION DURING FATIGUE AS A CRITERION FOR FAILURE. A LOCAL THEORY OF FRACTURE IN ENGINEERING MATERIALS Final Technical Report, 15 Aug. 1982 - 31 Oct. 1984
P. W. Whaley 15 Dec. 1984 94 p
(Contract N00014-82-K-0804)
(AD-A151289; AD-E751096; TR-2) Avail: NTIS HC A05/MF A01 CSCL 20/11

A mathematical model of fatigue crack nucleation initiation, and propagation is described using irreversible thermodynamics to quantify the damage caused by plastic straining. A mathematical model for local random yielding is used to derive a local theory of fracture and fatigue crack growth. The classical results of linear elastic fracture mechanics are reproduced; necessary and sufficient conditions for crack extension, critical stress and crack length, and sigmoidal shape of the crack growth curve. However, this model is not limited to small-scale yielding, includes treatment of loading history, and can be applied to crack growth retardation and closure as well as combined loading and spectrum loading. GRA

N85-25903# Naval Postgraduate School, Monterey, Calif.
AN EXPERIMENTAL INVESTIGATION INTO THE DYNAMIC RESPONSE OF A STIFFENED FLAT PLATE LOADED IMPULSIVELY BY AN UNDERWATER SHOCKWAVE M.S. Thesis
T. R. Rentz Jun. 1984 173 p
(AD-A151321) Avail: NTIS HC A08/MF A01 CSCL 20/1

The experiment conducted is in support of a broad-based study of underwater shock wave phenomena and the effects they have on ship's hull lethality. An air-backed flat plate with externally machined rectangular stiffeners and a clamped boundary condition was subjected to a shock wave loading generated by an eight pound TNT charge detonated underwater. The plate was instrumented to measure transient strains. The test structure acceleration and free field pressures were also measured. Preshot and postshot calculations were performed using the finite central difference computer code, EPSA (Elasto Plastic Shell Analysis). This code was modified to predict the nonlinear elastoplastic shell response for the plate. The EPSA interface program developed at NPS was utilized to produce color graphics which aided greatly in the analysis. GRA

N85-25904# Washington Univ., Seattle. Dept. of Mechanical Engineering.
DYNAMIC CRACK CURVING AND BRANCHING UNDER BIAXIAL LOADING
J. S. Hawong, A. S. Kobayashi, M. S. Dadkhah, B. S. J. Kang, and M. Ramulu Feb. 1985 26 p
(Contract N00014-76-C-0060)

(AD-A151451; UWA/DME/TR-85/50) Avail: NTIS HC A03/MF A01 CSCL 20/11

A 16 spark-gap camera was used to record the dynamic photoelastic patterns of ten centrally cracked, Homalite-100 specimens which fractured under ten biaxial stress ratios ranging from 3.7 to 0. The dynamic photoelastic patterns of curved cracks were used to verify the previously developed dynamic crack curving criterion. Cracks, which immediately curved upon propagation in three specimens under high biaxial loadings, were used to verify the static counterpart of the dynamic crack curving criterion. A previously developed dynamic crack branching criterion was verified by the dynamic photoelastic results involving cracks which eventually branched under low biaxial loadings. GRA

N85-25905# Aeronautical Research Labs., Melbourne (Australia).
EVALUATION OF THE BLIND HOLE DRILLING METHOD FOR THE MEASUREMENT OF RESIDUAL STRESS
C. S. Dentry and J. G. Sparrow Jul. 1984 38 p
(AD-A151459; ARL/STRUC-TM-383) Avail: NTIS HC A03/MF A01 CSCL 20/11

The blind hole drilling method has been employed to measure uniform residual stress fields; and an evaluation made of one approach to using this method when the stress field varies with depth. In particular stress fields generated by the application of uniaxial loads, by shot-peening and by heat treatment have been evaluated. The technique has been applied to the measurement of the residual stress field in the tyre bead seat region of a Boeing 727 main undercarriage wheel. This region has been found to have a significant level of residual stress perhaps indicative of the action of surface rolling. GRA

N85-25906# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
USER'S GUIDE FOR CONCRETE STRENGTH INVESTIGATION AND DESIGN (CSTR) Final Report
C. C. Hamby and W. A. Price, III Sep. 1984 102 p
(AD-A151617; AD-E301607; WES-INSTRUCTION-K-84-9) Avail: NTIS HC A06/MF A01 CSCL 11/2

CSTR, called X0066 in the Conversationally Oriented Real-Time Program-Generating System (CORPS) library, is a general-purpose computer program for the strength theory analysis or design of reinforced concrete beams or columns, in accordance with ETL 1110-2-265 for hydraulic structures. It is intended to be an easy-to-use program. Program CSTR is versatile in that its capabilities extend from design of new concrete hydraulic structures to investigation of already existing designs. Its analysis is based on the rectangular stress block described in ETL 1110-2-265. The design procedure is computer-aided rather than automatic and computes the minimum reinforcement required for a given width and depth, and displays the resulting interaction diagram. The program also computes and prints the minimum effective depth of a given section which satisfies strength requirements and steel ratio requirements without compressive reinforcement. The investigation procedure shows interaction diagrams and calculates compliance with ductile failure criteria. GRA

N85-25907# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CRACK CLOSURE CHARACTERISTICS CONSIDERING CENTER CRACKED AND COMPACT TENSION SPECIMENS M.S. Thesis
C. L. Henkel Dec. 1984 112 p
(AD-A151702; AFIT/GAE/AA/84D-9) Avail: NTIS HC A06/MF A01 CSCL 20/11

Due to growing use of expensive, high performance gas turbine engines in the United States Air Force, there is no need for improved failure prediction methods for critical high temperature engine components. This thesis expands current research in the area of high temperature, low cycle fatigue of IN-100 at 1350 F. IN-100 is a superplastically forged, nickel-based superalloy used in F-100 engine turbine disks. This thesis describes an in-house 2-D, finite element program named VISCO which employs the Bodner-Partom Constitutive equation to accurately model the principal features of completely reversed cyclic loading. VISCO is used to compare the effects on material behavior by considering a 2.5 Hz compact tension specimen, a .167 Hz compact tension specimen, and a 2.5 Hz center cracked specimen subjected to fully reversed cyclic loading with a stress intensity factor of 35 and 45 ksi/sq in. The comparisons point out that the findings of Linear Elastic Mechanics must be modified under conditions of high temperature viscoplasticity. GRA

N85-25908# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
TRANSITION REGION FOR CORNER CRACKS AT HOLES M.S. Thesis
P. A. Chansler Dec. 1984 135 p
(AD-A151835; AFIT/GAE/AA/84D-4) Avail: NTIS HC A07/MF A01 CSCL 11/6

This study develops correction factors for currently used stress intensity factor equations to more accurately predict stress intensity factors for a corner-crack emanating from a hole as it transitions to a uniform through-the-thickness crack. These correction factors resulted in an increase in accuracy for total life prediction and much better correlation between analytical stress intensity factor predictions and experimental results in the transition region for 2024-T351 and 7075-T651 aluminum alloys. An experimental program was undertaken to generate all 2024-T351 aluminum test data. The 7075-T651 aluminum test data was generated during earlier work. Correction factors developed by Opel for 7075-T651 aluminum were evaluated for 2024-T351 aluminum and found to be excessively conservative. Hartranft and Sih suggested the stress intensity factors be evaluated at an imaginary surface at an angle phi away from the front and hole-bore surfaces. These stress intensity factors could then be used in the life prediction models for life from a corner-crack until back surface penetration. Life predictions were made using the new model, an instantaneous model (which assumes a through-crack at back surface penetration), Opel's model, Brussat's model and the Collipriest-Ehret model. GRA

N85-25909# New Mexico Univ., Albuquerque. Bureau of Engineering Research.
ELASTIC-WORKHARDENING SDF (SINGLE-DEGREE-OF-FREEDOM) SYSTEM SUBJECTED TO RANDOM BLAST EXCITATIONS Interim Report
F. D. Ju, T. L. Paez, and F. Chang 26 Nov. 1984 52 p
(Grant AF-AFOSR-0086-81)
(AD-A151866; ME-130(84)AFOSR-993-1; AFOSR-85-0269TR) Avail: NTIS HC A04/MF A01 CSCL 13/13

An above ground explosion generates a shock wave in air, or airblast, and is accompanied by some duration of strong wind. Especially, the airblast from a nuclear detonation can cause extremely high air pressures and has a relatively long period of duration. When structures under design may be subjected to this sort of loading condition, it is necessary to analyze the behaviors of the structures when subjected to this kind of input to determine whether the structures can survive or not. The present phase of investigation developed a model to characterize the permanent set of SDF, bilinear hysteretic system subject to blast type loading. From that model, the elastic structural response was characterized. A computer program VAR.F was developed to compute the moments of critical measures of inelastic response. The means and variances the maximum displacement response of the permanent set and of the energy of dissipation are all useful in probabilistic analyses in structural design or in damage assessment of structures subjected to blast-type loadings. GRA

N85-25910# California Inst. of Tech., Pasadena. Graduate Aeronautical Labs.
A STUDY OF THE TIME DEPENDENCE IN FRACTURE PROCESSES RELATING TO SERVICE PREDICTION OF ADHESIVE JOINTS AND ADVANCED COMPOSITES Final Technical Report, 15 Aug. 1983 - 30 Jun. 1984
W. G. Knauss Bolling AFB, Washington, D.C. AFOSR 30 Jun. 1984 204 p
(Grant AF-AFOSR-0127-81)

(AD-A152064; GALCIT-SM-84-10; AFOSR-85-0239TR) Avail: NTIS HC A10/MF A01 CSCL 11/4

Problems related to fracture of bonded structures and composites were studied with emphasis on the time dependence of the failure process. Three subject areas in this theses are identified: (1) Residual stresses due to changes in temperature through the glass transition range. It is found that determination of the creep compliance or of the relaxation modulus is the most important material property for accurate stress determination general experimental and analytical agreement prevails. (2) In temperature accelerated crack propagation tests along interfaces it is found that crack propagation stops upon raising the temperature. The reason for this unexpected behavior is that with raising the temperature the elimination of residual stresses overcomes the reduction of viscosity so that crack arrest becomes possible. (3) Fatigue crack propagation is studied for a viscoelastic material. In contrast to metals the rate of crack growth per cycle is strongly affected by the frequency, declining with increasing frequency. However, the average velocity (cm/sec) per cycle increases with frequency. Thus it is more important to consider the time under stress than merely the number of cycles. GRA

N85-25911# Sandia Labs., Albuquerque, N. Mex.
NASTRAN-BASED SOFTWARE FOR THE STRUCTURAL DYNAMIC ANALYSIS OF VERTICAL AND HORIZONTAL AXIS WIND TURBINES
D. W. Lobitz 1984 17 p refs
(DE85-001712; SAND-84-0547C; CONF-841071-1) Avail: NTIS HC A02/MF A01

Throughout the vertical axis wind turbine program at Sandia, a significant effort has gone into developing finite element tools for predicting structural dynamic rotor response. Instead of creating new finite element packages, appropriate modifications to the NASTRAN code were made for the development of these tools. With this approach duplication of such things as input and output coding, finite element processors, and solution algorithms is avoided. Although some IMAP programming is required, most of the changes are effected through the use of NASTRAN a direct matrix input option. These matrix alterations are necessary to model a structure moving in a rotating frame. To date, tools which predict natural frequencies and mode shapes, and the forced vibration frequency response of the rotating turbine have been developed. More recently, for horizontal axis rotors, a capability has been created for computing transient behavior as the rotor turns in the wind. In this case, a solution procedure external to NASTRAN had to be employed in order to correctly attach the rotor hub, which moves in the rotating frame, to the lower which is modelled in a fixed frame. In all cases, these tools were compared with experimental data collected from various wind turbines and, for each, very satisfactory agreement was achieved. Author

N85-25912# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
DESIGN AND FABRICATION OF A UNIQUE ELECTROMECHANICAL MACHINE FOR LONG-TERM FATIGUE TESTING
K. W. Boling Dec. 1984 12 p
(Contract DE-AC05-84OR-21400)
(DE85-006524; ORNL-6115) Avail: NTIS HC A02/MF A01

An electromechanical machine was designed and fabricated for performing long term fatigue tests under conditions that simulate those in modern plants. The machine is now commercially available, its advantages over current electrohydraulic machines are lower initial cost, minimum maintenance requirements, and greater reliability especially when performing long tests. The machine operates in closed loop fashion by utilizing continuous feedback signals from the specimen extensometer or load cell, it is programmable for testing in strain or load control. The maximum ram rate is 0.056 mm/s (0.134 in./min), maximum ram travel is 102 mm (4 in.) and load capacity is + or - 44 (+ or - 10 kips). Induction heating controls specimen temperatures to 1000(0) C. DOE

N85-25913# Bendix Corp., Kansas City, Mo.
STRUCTURAL ANALYSIS OF ELECTRONIC ASSEMBLY HOUSING
T. R. Jespersen Feb. 1985 42 p refs
(Contract DE-AC04-76DP-00613)
(DE85-005794; BDX-613-3175) Avail: NTIS HC A03/MF A01

Finite element stress analysis was used to predict the improved structural behavior of an electronic housing by considering an additional fastener on either end of the two-part assembly. The aluminum housing was analyzed for component encapsulation loads. The COSMIC NASTRAN structural computer code was used to perform the analysis and SUPERTAB/OUTPUT display software was used to create the model and process the results. Contained are several computer generated stress contour plots and deformed structure plots as well as the conditions and engineering assumptions used in the finite element analysis. DOE

N85-25914# California Univ., Livermore. Lawrence Livermore Lab.
CONTROL OF A FLEXIBLE BEAM
Donald T. Gavel and Howard H. Wood 7 Jan. 1985 21 p refs
(Contract W-7405-eng-48)
(DE85-007243; UCID-20339) Avail: NTIS HC A02/MF A01

The shape of a flexible beam can be controlled by providing a torque at one point along the beam, so long as reliable measurements of the displacement of the beam along its length are available. A state space model and the strategy for control of a simple homogeneous beam structure, with some pointwise lumped masses are described. DOE

N85-25915# Westinghouse Hanford Co., Richland, Wash.
CREEP RATCHETING SIMPLIFIED METHODS EXPERIENCE FROM STRUCTURAL DESIGN OF ELEVATED TEMPERATURE COMPONENTS
L. K. Severud 1984 11 p refs
(Contract DE-AC06-76FF-02170)
(DE85-007433; HEDL-SA-3158-FP) Avail: NTIS HC A02/MF A01

During the last decade, advancements in inelastic analysis methods for evaluating elevated temperature structural response were considerable. Still, the desire to use simplified, less-costly, and easier-to-understand analysis methods for design remains very high. Past activities, using both detailed inelastic and simplified methods were very productive. It is instructive to view some of the lessons learned, to assess the technology status, and to provide guidance and identify development needs for future applications. Experience in use of simplified methods and some comparison to results from detailed inelastic solutions are surveyed. Guidance on inappropriate use is also provided as well as identification of domains of applicability for proper use of the various retacheting simplified methods. DOE

N85-25916# California Univ., Livermore. Lawrence Livermore Lab.
VARIATIONAL BOUNDS ON DARCY'S CONSTANT
J. G. Berryman Dec. 1984 39 p refs Presented at the Workshop on Homogenization and Effective Moduli of Mater. and Media, Minneapolis, 22 Oct. 1984
(Contract W-7405-eng-48)
(DE85-006638; UCRL-91882; CONF-8410231-1) Avail: NTIS HC A03/MF A01

Prager's varitional method of obtaining upper bounds on the fluid permeability (Darcy's constant) for slow flow through porous media is reexamined. By exploiting the freedom on has in choosing the trial stress distributions, several new results are derived. One result is a phase interchange relation for permeability; when the fluid-phase and particle-phase are interchanged for a fixed geometry, we find an upper bound on a linear combination of the complementary permeabilities. Another result is a significantly improved set of upper bounds on Darcy's constant when Prager's constant trial function is replaced by a Gaussian trial function. Nearly an order of magnitude improvement in the bounds is obtained for bounds using either two-point or three-point spatial

correlation functions to describe the statistics of the random geometry of the pore space. DOE

N85-25425# Joint Publications Research Service, Arlington, Va.
EVALUATION OF STRESS CONCENTRATION COEFFICIENTS IN BUTT-WELDED JOINTS WITH DISPLACED EDGES Abstract Only
M. V. Shakhmatov, I. A. Vorobyev, and S. V. Bogoslovskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 58 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 12, Dec. 1984 p 11-13 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

N85-25428# Joint Publications Research Service, Arlington, Va.
DURABILITY OF JOINTS OF 30KhGSA AND 12Kh18N10T STEELS MADE BY DIFFUSION WELDING Abstract Only
N. F. Kazakov, V. A. Trifonov, V. V. Nikolayenko, V. Yu. Varyanitsa, and N. V. Yermakov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-85-001) 20 Mar. 1985 p 59-60 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 12, Dec. 1984 p 46-49 (For primary document see N85-25395 15-23)
Avail: NTIS HC A05/MF A01

42 GEOSCIENCES (GENERAL)

N85-25917# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
LOW TEMPERATURE SCIENCE. SERIES A: PHYSICAL SCIENCES
1984 191 p refs In JAPANESE; ENGLISH summaries
(ISSN-0439-3538) Avail: NTIS HC A09/MF A01

The behavior of snow cover on mountain slopes, characteristics of snow cover on sea ice, the structure and growth of icicles, atmospheric electric elements at Earth surface during snowfall, meltwater percolation through snow cover, brine upward migration in sea ice, and the freezing of underground pipes are discussed. Frost damage to cave wall carvings and techniques for their preservation are also reported. For individual titles, see N85-25918 through N85-25925.

N85-25918# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
THE TEMPERATURE FLUCTUATION IN STABLE STRATIFICATION ABOVE SNOW COVER c47
Nobuyoshi Ishikawa, Hideaki Motoyama, and Kenji Kojima *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 69-78 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

Temperature inversion due to radiative cooling forms above the snowcovered field very easily during the clear calm night. In general, the atmosphere is fully turbulent when it is in the near neutral state, but with increasing stability (Ri) it tends to become intermittently turbulent and then quiet. Air temperatures were measured at every 20 sec by the ventilated resistance thermometer at 1.0m and 0.1m above the snow surface. The variance of air temperature was evaluated in order to show the magnitude of temperature fluctuation. Temperature fluctuation becomes large under the conditions at night in which the air is clear, wind speed is low and temperature gradient is large. Variance of air temperature increases with increasing stability, especially when R(i) > 0.1, and it is more dominant at the lower height above the snow surface. This temperature fluctuation appears at the level of the layer with a large temperature gradient (thermocline). If the intensity of turbulence can be expressed by the magnitude of the variance, turbulence seems to become strong with increasing stability which is in contrast to wind speed. Author

N85-25919# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
AN EQUATION OF PROFILE OF SNOW DRIFT DENSITY DURING SNOWFALL c47
Shunichi Kobayashi *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 79-83 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

Snowfall densities were estimated as asymptotes of the vertical profiles of snow drift density, which is to separate the amount of snowfall from the drift density in a snowstorm. To illustrate the vertical profile of drift density under the condition of snowfall, a general turbulent diffusion equation was considered. On an assumption that Ks and w are constant, and P = O, an equation of profile of snow drift density during the snowfall is obtained as follows: $n(2) = P/w + (n(o) - P/w) \exp(-2/Ks \times 2)$ where n is the drift density at the height z, w is the apparent fall velocity of snow particles, Ks is the apparent diffusivity, n(0) is the drift density at the surface and P is the vertical flux of snowfall. If $w\ n(o) > P > O$, the asymptote of the profile in the z-direction approaches the snowfall density P/w. As a result, the snow drift density was measured at eight heights above the snow surface (between 0.3 to 28 m), and the snowfall densities were estimated as asymptotes of vertical profile of drift density in the snowstorms. Author

N85-25920# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
MEASURING METHODS OF ATMOSPHERIC ELECTRIC ELEMENTS AT THE EARTH'S SURFACE DURING SNOWFALL AND INVESTIGATION OF THESE RELATIONSHIPS c47
Tatsuo Endoh and Takashi Taniguchi *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 85-100 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

Several measuring equipments and methods were developed and altered to measure the elements of atmospheric electricity that is atmospheric electric field, precipitation charge, precipitation current, space charge and ion concentration under the severe snowfall conditions. Observational results certify the mirror image relation between the electric field and the precipitation charge, although the cause of this relation was not clarified. The space charge carrier, which has the same sign as the electric charge with precipitating ice particles, may be considered to be the fragments broken off from such ice particles. The ion concentration observed may be considered to result from the electric field through the electrode effect. Author

N85-25921# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
CASE STUDIES OF SNOW CLOUDS BY MEANS OF SNOW CRYSTAL SONDES c47
Sinri Irikawa, Tatsuo Endoh, Tomomi Yamada, and Gorow Wakahama *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 101-112 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

A snow crystal sonde and an ordinary radio sonde with a land-based real-time data processor were used to collect basic data concerning microphysics of snow clouds. The vertical distributions of snow crystal shape, size, number concentration, and the relative value of the up- and the down-draft, as well as the vertical profiles of air temperature, humidity, wind speed and direction were observed. Two typical types of snow clouds, one caused under the monsoon pattern and the other under the low pressure pattern in the synoptic scale, are discussed. To explain the obvious difference of crystal size distribution at the ground level in the two cases, the growth of the individual initial crystal with the original size of 10 microns was simulated by the well-known crystal growth equations at every level of a snow cloud on reasonable assumptions from the observed profiles of air temperature, humidity, and the up-and down-drift. It is revealed that the structure of both drafts of air mass between the top of a snow

cloud and the ground is the most important factor in determining the size distribution of snow particles at the ground level. A.R.H.

N85-25922# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
OBSERVATION OF PRECIPITATING CLOUDS BY A VERTICALLY POINTING RADAR AT MORINO IN THE IBURI DISTRICT, HOKKAIDO, JAPAN **c47**
Yasushi Fujiyoshi, Tatsuo Endoh, and Tomomi Yamada *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 113-123 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

Precipitating clouds were observed using a vertically pointing radar of 3.2 cm in wavelength, which was set at Morino in the mountainside of the Ihuri District of Hokkaido district. Results show that the clouds which brought a typical local heavy rainfall on the Orofure mountain range were the well-developed cumulo-nimbus whose radar-echo top was higher than 7 km. Even when the low-level convective clouds coexisted with the middle-level ice clouds, no heavy rainfall occurred. However, the amount of rainfall was larger when these two types of clouds passed through the site of observation simultaneously than that when they passed separately. In some cases, the peak value of the amount of rainfall did not appear on the Orofure mountain range, but on the southern slope of Mt. Tarumae some ten kilometers away. Comparison of short-time (one minute) change of rainfall intensity at Morino (mountainside) with that at Shiraoi (coastal side) show that duration of rainfall was shorter but the peak value of rainfall intensity was larger at Shiraoi than that at Morino. A.R.H.

N85-25923# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
AN EXPERIMENTAL STUDY OF BRINE UPWARD MIGRATION IN THIN SEA ICE **c48**
Takashi Kasai and Nobuo Ono *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 149-155 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

Artificial pools, in which young ice was formed, were opened within a fast-ice sheet in a lagoon. The salinity of the 1-mm thick surface layer of the young ice was as high as 42.4% which exceeds the seawater salinity of 31.0%. The surface salinity increased with rising air temperature. When a load (75 kg) was placed on the fast ice near the pool, the seeped brine of 72.5% in saliniy was observed on the surface of the young ice; and when the load was removed, the brine disappeared. Both upward and downward brine permeabilities, measured in the laboratory, decreased logarithmically with lowering surface temperature. Such a remarkable anisotropy was observed as the upward permeability was greather than the downward permeability, and the ratio of the upward to the downward permeability increased with lowering surface temperature from 5 at -3 C to 33 at -5 C. It is concluded that the high-salinity surface layer is formed when the sea ice is not so thick and the surface temperature is comparatively warm as a consequence of upward brine migration and maintained afterwards. Though the sea ice is permeable upward when the surface temperature is comparatively warm, the sea ice is not so permeable downward as upward and the brine which seeps onto the surface because of a pressure increase within the brine channels continues to stay within the surface layer. Author

N85-25924# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
CHARACTERISTICS OF SNOW COVER ON SEA ICE AND FORMATION OF SNOW ICE II **c43**
Takatoshi Takizawa *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 157-161 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

On the morning of February 9th, fast ice (21 cm thick) on Lake Saroma was covered with snow 1.8 cm deep. The snow was wet and its salinity was as high as 37%. Thereafter, the salinity decreased rapidly and fell to 21% two days later. The wet snow was frozen into a snow ice on 13th. Brine exclusion did not take place and the salinities of wet snow and snow ice were almost constant from 11th to 14th. On March 13th, the snow ice had 20% salinity and the wet snow on it has 21% salinity. A test pool was made by removing ice blocks from the fast ice sheet. The snow cover 3.5 cm deep on the the newly formed ice in the pool was wet thoroughly on 14th February and had 20% salinity. One month later, on 13th March, the lower layer of the wet snow was found to have changed to snow ice with 12% salinity. It is reasonable to expect that the snow ice, just after it was formed, had the salinity of about 20% by the analogy to the change from the wet snow to the snow ice on the fast ice. This low value of salinity, therefore, suggests that it decreased gradually with time. However, the salinity of ice on the fast ice kept the 20% salinity on the same day. The wet snow on both fas ice and pool ice kept a salinity of more than 20%. Author

N85-25925# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
CHARACTERISTICS OF FAST SEA ICE COLLECTED NEAR BARROW, ALASKA **c48**
Toshiyuki Kawamura *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 163-169 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

Core samples of shore fast sea ice off Barrow (162 cm long) and fast sea ice at Elson Lagoon, (102 cm long) were collected. The average grain area, average brine layer spacing (a) and salinity (s) measured at every 10 cm in depth are discussed and compared for both the shore ice and the lagoon ice. Crystallographic orientations determined by X-ray Laue photography are analyzed. A.R.H.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N85-25926 Delaware Univ., Newark.
ANALYSIS OF SUSPENDED SEDIMENT DISTRIBUTIONS IN THE SURFACE WATERS OF DELAWARE BAY USING REMOTE SENSING OF OPTICAL PROPERTIES Ph.D. Thesis
Richard Paul Stumpf 1984 170 p
Avail: Univ. Microfilms Order No. DA8500867

The color of coastal water can be expressed as a vector in an n-dimensional color space, a space defined by the radiance detected in different wavelengths or bands. In Delaware Bay, there are two water units having relatively constant color, one over the platform and the other in the deep central region. The vector models shows the same differences in the units pigments and productivity as is observed from ship. The platform (P*) unit associates with greater pigment quantities, the central bay (C-) unit with smaller quantities. The more productive P* units most extensive in the spring, corresponding with bloom conditions; C- is largest in water. River discharge varies the upbay limit of C-. Wind induced transport and tides effect the baymouth but were not observed to associate with variations in the distribution of units within the bay. The P* unit overlies the areas of mud deposition and its higher productivity may be related to outwelling of nutrients from the salt marshes. Sharp boundaries and fronts between P* and C- occur often, suggesting that P* may be closely coupled to the marsh and shoreline than to the central bay. Dissert. Abstr.

N85-25927*# Arizona State Univ., Tempe. Dept. of Geology.
ANALYSIS OF THE GRAN DESIERTO, PINACTE REGION, SONORA, MEXICO, VIA SHUTTLE IMAGING RADAR
Ronald Greeley, Philip R. Christensen, John F. McHone, Yemane

Asmerom, and James R. Zimbelman 1984 106 p refs Sponsored by NASA
(NASA-CR-175711; JPL-9950-1026; NAS 1.26:175711) Avail: NTIS HC A06/MF A01 CSCL 17I

The radar discriminability of geolian features and their geological setting as imaged by the SIR-A experiment is examined. The Gran Desierto and Pincate volcanio field of Sonora, Mexico was used to analyze the radar characteristics of the interplay of aeolian features and volcano terrain. The area in the Gran Desierto covers 4000 sq. km. and contains sand dunes of several forms. The Pincate volcanio field covers more than 2.000 sq. km. and consists primarily of basaltic lavas. Margins of the field, especially on the western and northern sides, include several maar and maar-like craters; thus obtaining information on their radar characteristics for comparison with impact craters. B.G.

N85-25928* National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
SURVEY OF REMOTE SENSING TECHNIQUES FOR WAVE MEASUREMENT
Norden E. Huang May 1985 76 p refs
(NASA-TM-84429; NAS 1.15:84429) Avail: Issuing Activity CSCL 08C

Remote sensing is to sense or measure something without direct physical contact by the instrument or the observer. Remote sensing of ocean waves is the most widely used method, and the oldest one; visual observations made with human eyes. Visual observations of sea state are routinely recorded by all research vessels and oceangoing ships. These data constitute the bulk of the existing data base used by engineers and scientists. The principles of remote sensing techniques for ocean waves, and a summary of remote sensing instruments and results are presented. E.A.K.

N85-25929*# Wisconsin Univ., Madison. Space Science and Engineering Center.
TECHNICAL DEVELOPMENT TO IMPROVE SATELLITE SOUNDING OVER RADIATIVELY COMPLEX TERRAIN Final Report, 1 Sep. 1982 - 30 Nov. 1984
Anthony J. Schreiner Apr. 1985 94 p refs
(Grant NAG5-275)
(NASA-CR-175746; NAS 1.26:175746) Avail: NTIS HC A05/MF A01 CSCL 05B

High resolution topography was acquired and applied on the McIDAS system. A technique for finding the surface skin temperature in the presence of cloud and reflected sunlight was implemented in the ALPEX retrieval software and the variability of surface emissivity at microwave wavelength was examined. Data containing raw radiances for all HIRS and MSU channels for NOAA-6 and 7 were used. METEOSAT data were used to derive cloud drift and water vapor winds over the Alpine region. A.R.H.

N85-25930# New South Wales Univ., Kensington (Australia). Dept. of Computer Science.
DATA STRUCTURE CONSIDERATIONS IN AUTOMATIC CARTOGRAPHY M.S. Thesis. Abstract Only
Robert Benjamin John Feb. 1984 4 p
Avail: NTIS HC A02/MF A01

The structuring of digital topographic mapping data for use in computer assisted cartography is examined. The data structure considerations are restricted to vector data format being the most commonly implemented format for such applications. (Raster digitizing systems are becoming available but the resultant data is usually converted to vector format to enable feature tagging and for minimal storage requirements.) The digital mapping process is described and thereafter the data manipulation requirements within that process are defined. With those requirements in mind, the elements of a vector data structure for the capture, storage and manipulation of cartographic data are examined. The fundamentals of digitization are developed through a taxonomy of graphic feature element types, the use of identification codes, alternative methods of digitization and symbology requirements. The fundamentals of storage and retrieval are examined and it is determined that data for line features should be separated into two record types. M.G.

N85-25931# Mitre Corp., McLean, Va.
SEASAT REPORT
K. Case, R. Dashen, W. Munk, J. Vesecky, K. Watson, F. Zacheriasen et al Jan. 1985 205 p
(Contract F19628-84-C-0001)
(AD-A151283; JSR-83-203) Avail: NTIS HC A10/MF A01 CSCL 20/4

This report is concerned with the narrow V-shaped wakes seen behind surface ships by the SEASAT synthetic aperture radar. The authors do not believe that the V-shaped wakes seen by the SEASAT satellite are external waves because ship wakes are three to four orders of magnitude too weak to explain the observed radar returns. If the V-shaped wakes are not produced by internal waves, then by default they must be manifestations of the Kelvin wake. Present understanding of rear axis generation of Kelvin wakes (thin ship theory) does not adequately explain the effects seen by SEASAT-non-linear effects probably need to be included. Also ships propeller-generated Kelvin wakes do not appear to be strong enough to create the wakes seen. Consequently, we are left with a somewhat unsatisfying situation. We believe that narrow wakes cannot be produced by ship generated internal waves, (except under extreme conditions) because these are too weak by three to four orders of magnitude. Therefore, they must be due to the Kelvin wake. But we have not yet been able to analyze the Kelvin wake sufficiently well theoretically to identify just which feature of the Kelvin wake SEASAT is seeing. GRA

N85-25932# Royal Australian Navy Hydrographic Service, Canberra.
REPORT OF THE HYDROGRAPHIC SERVICE ROYAL AUSTRALIAN NAVY FOR THE YEAR ENDED 30TH JUNE 1984, ISSUE NUMBER 20 Annual Report, 1 Jul. 1983 - 30 Jun. 1984
1984 56 p
(AD-A151460) Avail: NTIS HC A04/MF A01 CSCL 08/2

Contents: Hydrographic Surveying; Oceanography; Meteorology; Personnel; Training; Chart Production; Chart Distribution and Supply; Notices to Mariners; Sailing Directions, Nomenclature and Maritime Boundaries; Tides; Equipment; Visits and Public Relations; Appendices: Chart and Drawing Office Production, Hydrographic Information from Non-Service Sources, Distribution and Supplies, Manpower, Organisational Chart, Hydrographic Notes, Expendable Bathythermograph Observations. GRA

N85-25289# Joint Publications Research Service, Arlington, Va.
SPECTRAL ANALYSIS OF DIURNAL NONUNIFORMITY OF EARTH'S ROTATION Abstract Only
G. P. Pilnik *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 15 Transl. into ENGLISH from Astronomicheskiy Zh. (USSR), v. 61, no. 4, Jul.-Aug. 1984 p 806-811 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25340# Joint Publications Research Service, Arlington, Va.
STUDY OF VOLGA RIVER DELTA USING SPACE PHOTOSURVEY MATERIALS Abstract Only
G. F. Krasnozhon and Y. S. Sokolov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 107 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 27-32 Original language document announced as A84-43204 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25341# Joint Publications Research Service, Arlington, Va.
USE OF SPACE INFORMATION IN PETROLEUM- AND GAS-PROSPECTING WORK (EXAMPLE OF SOUTHERN MANGYSHLAK) Abstract Only
V. T. Vorobyev and D. S. Orudzheva *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 107-108 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984

p 33-38 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25342# Joint Publications Research Service, Arlington, Va.
EXAMPLE OF JOINT USE OF DATA FROM SURFACE STUDIES AND SPACE PHOTOGRAPHS IN INVESTIGATING DYNAMICS OF ZONE OF NORTH ZERAVSHAN SEISMOGENIC FAULTS Abstract Only
A. I. Lavrusevich and D. D. Buzrukov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 108-109 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 39-43 Original language document announced as A84-43206 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25343# Joint Publications Research Service, Arlington, Va.
RELATIVE GEOLOGICAL INFORMATION YIELD FROM SMALL-SCALE MULTIZONAL SPACE IMAGES (EXAMPLE OF FERGAMA DEPRESSION AND ITS MOUNTAINOUS MARGINS) Abstract Only
B. G. Azimov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 109 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 44-49 Original language document announced as A84-43207 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25344# Joint Publications Research Service, Arlington, Va.
CHOICE OF OPTIMUM PAIRS OF SPECTRAL INTERVALS FOR IR-RANGE SURVEY OF EARTH'S SURFACE Abstract Only
A. V. Arefyev, V. P. Vlasov, and A. B. Karasev *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 110 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 50-59 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25346# Joint Publications Research Service, Arlington, Va.
VARIABILITY OF COEFFICIENTS OF SPECTRAL BRIGHTNESS OF SOILS Abstract Only
P. P. Fedchenko and O. A. Borisova *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 111-112 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 77-82 Original language document announced as A84-43212 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25347# Joint Publications Research Service, Arlington, Va.
EVALUATING IDENTIFIABILITY IN REMOTE SENSING PROBLEMS Abstract Only
O. Gulyas and T. Farago *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 112-113 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 83-88 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25348# Joint Publications Research Service, Arlington, Va.
IDENTIFYING LAND USE STRUCTURES OF MULTIZONAL AEROSPACE PHOTOGRAPHS USING DIGITAL DATA PROCESSING Abstract Only
I. Schmidt and H. Stoye *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 113 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 89-96 Original language document announced as A84-43214 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25349# Joint Publications Research Service, Arlington, Va.
EXPERIENCE IN AUTOMATION OF DATA PROCESSING IN INTERPRETATION AND DEFINING OF LINEAR ELEMENTS FROM SPACE PHOTOGRAPHS Abstract Only
V. Y. Goltveger, V. A. Ilin, and N. M. Kunina *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 114 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 97-105 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25350# Joint Publications Research Service, Arlington, Va.
USING SM-4 OMEGA SYSTEM IN CHECKING AND EDITING DIGITAL TERRAIN INFORMATION Abstract Only
P. A. Kalantayev, E. G. Mikhaltsov, V. P. Pyatkin, R. M. Salavatov, and V. G. Chubukov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 115 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 106-114 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25354# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF HYDROMETEOROLOGICAL CONDITIONS IN ANTARCTIC COASTAL WATERS ACCORDING TO DATA FROM HYDROLOGICAL AND SATELLITE OBSERVATIONS Abstract Only
V. V. Golosov and O. A. Rebenkova *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 118 Transl. into ENGLISH from Vestnik Leningradskogo Univ.: Geol., Geografiya (USSR), no. 3, Sep. 1984 p 96-99 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25355# Joint Publications Research Service, Arlington, Va.
PRELIMINARY PROCESSING OF LASER RANGING DATA FROM LAGEOS ARTIFICIAL EARTH SATELLITE DURING SHORT MERIT PROGRAM OBSERVATION PERIOD Abstract Only
V. V. Nesterov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 119 Transl. into ENGLISH from Pisma v Astronomicheskiy Zh. (USSR), v. 10, no. 5, May 1984 p 397-400 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25356# Joint Publications Research Service, Arlington, Va.
INCREASING THE ACCURACY OF PROCESSING RADAR PICTURES BY EXCLUDING SYSTEMATIC POINT COORDINATE ERROR COMPONENT Abstract Only
V. G. Yelyushkin and B. V. Pronin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 119-120 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geod. i Aerofotosyemka (USSR), no. 4, Jul.-Aug. 1984 p 65-72 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25358# Joint Publications Research Service, Arlington, Va.
DETERMINING CHARACTERISTICS OF OPTICAL RADIATION REFLECTORS BASED ON RESULTS OF REMOTE SENSING Abstract Only
I. F. Pisarevskiy *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 120-121 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geod. i Aerofotosyemka (USSR), no. 4, Jul.-Aug. 1984 p 93-98 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25359# Joint Publications Research Service, Arlington, Va.
USE OF SPACE PHOTOGRAPHIC INFORMATION TO MAP PLANT COVER Abstract Only
T. V. Vereshchaka, B. V. Krasnopevtseva, and V. V. Usova *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 121 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geod. i Aerofotosyemka (USSR), no. 4, Jul.-Aug. 1984 p 99-106 Original language document announced as A85-11815 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25924# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
CHARACTERISTICS OF SNOW COVER ON SEA ICE AND FORMATION OF SNOW ICE II
Takatoshi Takizawa *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 157-161 refs In JAPANESE; ENGLISH summary (For

primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

N85-25998*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOIL MOISTURE AND EVAPOTRANSPIRATION ESTIMATES BASED ON SATELLITE DATA
P. Wetzel, R. Woodward (GSC), and J. Chang *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 4 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 08M

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N85-25933 West Virginia Univ., Morgantown.
INVISCID UPWIND FINITE DIFFERENCE MODEL FOR TWO DIMENSIONAL VERTICAL AXIS WIND TURBINES Ph.D. Thesis
R. Ganesh Rajagopalan 1984 182 p
Avail: Univ. Microfilms Order No. DA8429874

A numerical technique is developed to determine the flow characteristics and performance of a two dimensional vertical axis wind turbine. The numerical scheme is based on Patankar's SIMPLER algorithm. The conservation of mass and momentum equations are solved using a finite difference procedure without the necessity of introducing an irrotationality constraint. The computational domain is subdivided into control volumes in cylindrical coordinates and the turbine blades are modelled as a porous cylindrical shell of one control volume thickness. The characteristics of the turbine, such as the power coefficient and wake profiles are computed and compared with previous investigations. It has been found that the computer run times are relatively short and the results compare well with other theories.
Dissert. Abstr.

N85-25934 Arizona State Univ., Tempe.
MODELING AND OPTIMIZATION OF A MULTIPLE-CELL PHOTOVOLTAIC CONVERTER SYSTEM Ph.D. Thesis
Glenn William Masden 1984 308 p
Avail: Univ. Microfilms Order No. DA8501322

A mathematical model is developed for the multiple-cell photovoltaic system accounting for all the significant aspects of the energy conversion process. The spectrum-splitting method uses one or more low loss optical filters to separate and direct parts of the spectrum to individual cells. The mathematical model is implemented in a computer program designed to allow flexibility in system configuration and incorporates optimization features to enable design of systems having greatest efficiency. The computer program is corroborated by data from a two-cell experimental system using Si and AlGaAs/GaAs. Techniques of determining parameters characterizing the cell and its equivalent circuit from I-V curve and spectral response measurements are presented.
Dissert. Abstr.

N85-25935*# Wilkes Coll., Wilkes-Barre, Pa. Dept. of Engineering and Physics.
ELECTRICAL RESEARCH ON SOLAR CELLS AND PHOTOVOLTAIC MATERIALS Quarterly Report
John Orehotsky 31 Aug. 1984 98 p
(Contract NAS7-918)
(NASA-CR-175699; DOE/JPL-956766-02; JPL-9950-971; NAS 1.26:175699; DRL-213; QR-2) Avail: NTIS HC A05/MF A01 CSCL 10A

The flat-plate solar cell array program which increases the service lifetime of the photovoltaic modules used for terrestrial energy applications is discussed. The current-voltage response characteristics of the solar cells encapsulated in the modules degrade with service time and this degradation places a limitation on the useful lifetime of the modules. The most desirable flat-plate array system involves solar cells consisting of highly polarizable materials with similar electrochemical potentials where the cells are encapsulated in polymers in which ionic concentrations and mobilities are negligibly small. Another possible mechanism limiting the service lifetime of the photovoltaic modules is the gradual loss of the electrical insulation characteristics of the polymer pottant due to water absorption or due to polymer degradation from light or heat effects. The mechanical properties of various polymer pottant materials and of electrochemical corrosion mechanisms in solar cell material are as follows: (1) electrical and ionic resistivity; (2) water absorption kinetics and water solubility limits; and (3) corrosion characterization of various metallization systems used in solar cell construction.
E.A.K.

N85-25936*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
MODULE PERFORMANCE AND FAILURE ANALYSIS AREA: FLAT-PLATE SOLAR ARRAY PROJECT Final Report
Eric Tornstrom 21 Nov. 1984 29 p Sponsored by NASA
(NASA-CR-175689; DOE/JPL-956335-1; JPL-9950-977; DRL-189; DRD-SE-1; NAS 1.26:175689) Avail: NTIS HC A03/MF A01 CSCL 10A

A redesign of the initial (Group I) Mobile Solar Block V module was done and documented. Manufacturing experience and accelerated test data from Group I formed the basis for the redesign. Ten Block V Group II modules were submitted for evaluation and the results are presented.
Author

N85-25937*# Florida Univ., Gainesville. Dept. of Electrical Engineering.
HEAVY DOPING EFFECTS IN HIGH EFFICIENCY SILICON SOLAR CELLS Quarterly Report, 1 Jul. - 30 Sep. 1984
F. A. Lindholm 30 Sep. 1984 23 p refs Sponsored by NASA
(NASA-CR-175687; DOE/JPL-956525-84/5; JPL-9950-989; DRL-198; NAS 1.26:175687) Avail: NTIS HC A02/MF A01 CSCL 10A

Several of the key parameters describing the heavily doped regions of silicon solar cells are examined. The experimentally determined energy gap narrowing and minority carrier diffusivity and mobility are key factors in the investigation.
G.L.C.

N85-25938*# Joint Center for Graduate Study, Richland, Wash. Solar Energy Lab.
INVESTIGATION OF SILICON SURFACE PASSIVATION BY SILICON NITRIDE FILM DEPOSITION Final Report, 1 Sep. 1983 - 31 Aug. 1984
Larry C. Olsen Sep. 1984 65 p refs
(NASA-CR-175693; DOE/JPL-956614-84/01; JPL-9950-1001; NAS 1.26:175693) Avail: NTIS HC A04/MF A01 CSCL 10A

The use of Sin sub x grown by plasma enhanced chemical vapor deposition (PECVO) for passivating silicon surfaces was studied. The application of PECVO SiN sub x films for passivations of silicon N+/P or P+/N solar cells is of particular interest. This program has involved the following areas of investigation: (1) Establishment of PECVO system and development of procedures for growth of SiN sub x; (2) Optical characterization of SiN sub x films; (3) Characterization of the SiN sub x/Si interface; (4) Surface recombination velocity deduced from photoresponse; (5) Current-Voltage analyses of silicon N+/P cells; and (6) Gated diode device studies.
G.L.C.

N85-25939*# Westinghouse Research and Development Center, Pittsburgh, Pa.
DEVELOPMENT OF HIGH-EFFICIENCY SOLAR CELLS ON SILICON WEB Quarterly Progress Report, Oct. - Dec. 1984
A. Rohatgi, D. L. Meier, R. B. Campbell, T. W. OKeefe, and P.

Rai-Choudhury 5 Feb. 1985 30 p refs Prepared for JPL
(Contract JPL-956786)
(NASA-CR-175707; DOE/JPL-956786-85/3; JPL-9950-1010; NAS 1.26:175707; DRD-SE5; DRL-212; QPR-3) Avail: NTIS HC A03/MF A01 CSCL 10A

The oxidation conditions to passive web cells were established to reduce surface recombination velocity. Evaporated double-layer antireflective coating using ZnSe and MgF2 films to minimize reflection losses from the front surface and an aluminum back-surface reflector to utilize the unabsorbed long wavelength photons were developed. Web solar cells were fabricated by incorporating the above advanced features. Efficiencies as high as 16.9% were obtained on 1 cm x 1 cm dendritic web silicon cells on 0.37 ohm-cm web crystals. A combined effect of oxide passivation, exaporated double-layer AR coating, and back-surface reflector gave approximately 59% improvement in the short-circuit current and 69% increase in cell efficiency compared to the counterpart baseline cell with no passivation, AR Coating, or back-surface reflector. Low-resistivity web crystals (0.37 ohm-cm, crystal #4-275) were grown to take advantage of heavy doping in the base. B.G.

N85-25940*# Florida Univ., Gainesville. Dept. of Electrical Engineering.
HEAVY DOPING EFFECTS IN HIGH EFFICIENCY SILICON SOLAR CELLS Quarterly Report, 1 Oct. - 31 Dec. 1984
F. A. Lindholm, A. Neugroschel, P. T. Landsberg, and C. T. San (Illinois Univ., Urbana) 31 Dec. 1984 36 p refs Sponsored by NASA
(NASA-CR-175681; DOE/JPL-956525-85/6; JPL-9950-1033; DRL-198; NAS 1.26:175681) Avail: NTIS HC A03/MF A01 CSCL 10A

A model for bandgap shrinkage in semiconductors is developed and applied to silicon. A survey of earlier experiments, and of new ones, give an agreement between the model and experiments on n- and p-type silicon which is good as far as transport measurements in the 300 K range. The discrepancies between theory and experiment are no worse than the discrepancies between the experimental results of various authors. It also gives a good account of recent, optical determinations of band gap shrinkage at 5 K. Author

N85-25941*# Engelhard Industries, Inc., Edison, N.J. Specialty Chemicals Div.
DEVELOP AND TEST FUEL CELL POWERED ON-SITE INTEGRATED TOTAL ENERGY SYSTEMS. PHASE 3: FULL-SCALE POWER PLANT DEVELOPMENT Quarterly Technical Progress Report, May - Jul. 1984
A. Kaufman, S. Pudick, C. L. Wang, J. Werth, and J. A. Whelan 6 Nov. 1984 20 p
(Contracts DEN3-241; DE-AI01-80ET-17088)
(NASA-CR-174887; DOE/NASA/0241-14; NAS 1.26:174887) Avail: NTIS HC A02/MF A01 CSCL 10A

Two 25-cell, 13 inch x 23 inch (4kW) stacks were started up to evaluate the reliability of component and stack technology developed through the end of 1983. Both stacks started up well and are running satisfactorily on hydrogen-air after 1900 hours and 800 hours, respectively. A synthetic-reformat mixing station is nearing completion, and both stacks will be operated on reformate fuel. A stack-protection control system was placed in operation for Stack No. 2, and a similar set-up is in preparation for Stack No. 1. This system serves to change operating conditions or shut the stack down to avoid deleterious effects from nonstack-related upsets. The capability will greatly improve changes of obtaining meaningful long-term test data. E.A.K.

N85-25942*# Essex Corp., Orlando, Fla.
A PORTABLE BATTERY FOR OBJECTIVE, NON-OBSTRUSIVE MEASURES OF HUMAN PERFORMANCES Final Report
Robert S. Kennedy 1984 13 p refs Presented at the Advances in NASA Relevant, Minimally Invasive Instrumentation, Pasadena, Calif., 1984
(Contract NAS9-16982)
(NASA-CR-171868; NAS 1.26:171868) Avail: NTIS HC A02/MF A01 CSCL 10C

The need for a standardized battery of human performance tests to measure the effects of various treatments is pointed out. Progress in such a program is reported. Three batteries are available which differ in length and the number of tests in the battery. All tests are implemented on a portable, lap held, briefcase size microprocessor. Performances measured include: information processing, memory, visual perception, reasoning, and motor skills, programs to determine norms, reliabilities, stabilities, factor structure of tests, comparisons with marker tests, apparatus suitability. Rationale for the battery is provided. E.A.K.

N85-25943*# Purdue Univ., Lafayette, Ind. Lab. for Electroceramics.
INK JET PRINTING OF SILVER METALLIZATION FOR PHOTOVOLTAICS Quarterly Technical Report, 1 Oct. - 30 Dec. 1984
R. W. Vest 25 Jan. 1985 173 p Prepared in cooperation with JPL, California Inst. of Tech.
(Contract NAS7-100)
(NASA-CR-175798; NAS 1.26:175798; DE85-007127; DOE/JPL-9057031-85/1; DRD-SE-2) Avail: NTIS HC A08/MF A01 CSCL 10A

Progress was made in the continuing development of the ink jet printing system for thick film circuits. The unit being used is a prototype ink jet printer. One of the first tasks completed was the complete documentation of this ink jet printing system as it existed. It was determined that this was an essential step in deciding what modifications were needed to the system and how these modifications would be implemented. Design modification studies were started for electronic, mechanical, and programming aspects of the ystem. The areas needeing improvement were discussed and applicable changes decided upon. Some improvments were completed. Although the general areas needing improving were identified and some changes decided upon, the exact details of how other changes can be implemented are yet been decided. DOE

N85-25944# Cornell Univ., Ithaca, N.Y.
STUDIES OF PHOTOSYNTHETIC ENERGY CONVERSION Final Report, 1 Dec. 1981 - 30 Nov. 1984
Roderick K. Clayton and Andre T. Jagendorf 1 Jan. 1985 6 p
(Contract DE-AC02-76ER-03162)
(DE85-005973; DOE/ER-03162/59) Avail: NTIS HC A02/MF A01

The composition, structure and properties of reaction centers from Rhodopseudomonas viridis were examined. Four distinct polypeptides were found, one of which contains heme groups. Linear dichroism showed the 2 hemes have different orientations in the reaction center. In this bacterium containing BCh1 b, not a, circular dichroism indicated the absence of strong excitonic coupling between the 2 BCh1 b's in the antenna complex. Isolated chromatophores are unusual in not having any detectable ATPase. The intrinsic portion, F/sub O/, is also missing. Equipment improvements included installation of a computer, interfacing with data acquisition systems, and development of programs for rapid analysis of data on absorption, linear or circular dichroism, and fluorescence. The dichroism spectrometer was rebuilt to measure absorbance, linear or circular dichroism in modulated light; and the dual wavelengths spectrometer was updated to greater sensitivity and resolution. A system to combine fluorescence measurements with absorbancy of quinone redox changes was developed, and used to estimate the proportion of alpha and beta centers in a given PSII population. DOE

N85-25945# Eagle-Picher Co., Joplin, Mo. Electronics Div.
CALCIUM/THIONYL CHLORIDE BATTERY TECHNOLOGY Interim Report, Jun. 1983 - May 1984
R. I. Higgins and I. Potts Wright-Patterson AFB, Ohio AFWAL Jan. 1985 51 p
(Contract F33615-81-C-2076)
(AD-A151975; AFWAL-TR-84-2075) Avail: NTIS HC A04/MF A01 CSCL 10/3

This program is structured to develop both active and reserve

configuration calcium-thionyl chloride electrochemical cells. The active configuration has required extensive work toward the storability on the calcium-anode in electrolyte solution. A variety of electrolyte salts have been screened in an effort to improve storage characteristics. The reserve configuration could lend itself to high temperature operation since calcium has such a high melting point when compared to lithium. Emphasis has been on the development of a high discharge rate cathode structure. GRA

N85-25946# CSI Resource Systems, Inc., Boston, Mass.
LARGE-SCALE COMMERCIAL COMBUSTION SYSTEMS FOR PRODUCING ENERGY FROM MUNICIPAL SOLID WASTE
Feb. 1985 39 p refs
(Contract DE-AC01-80CS-24312)
(DE85-007097; DOE/CS-24312/8) Avail: NTIS HC A03/MF A01

The large scale combustion systems available on the US market today that use MSW only as fuel are reviewed. Its purpose is to provide waste to energy project participants with basic technical information to facilitate an understanding of the operation and performance of the technologies employed. General technical descriptions of the two types of large scale systems, mass burning and refuel derived fuel burning, are presented. Performance characteristics of each system, based on material and energy balances, are discussed. A description of the typical energy product options (steam only, cogeneration of steam and electricity, or ejectricity only) that may be considered for both types of systems depending on the available market(s) for energy is included. The sources and types of emissions from these systems (air, water, ash and other residue, noise, and odor) are discussed. E.A.K.

N85-25947# Battelle Columbus Labs., Ohio.
A STUDY OF THE STABILITY OF CADMIUM SULFIDE/COPPER SULFIDE AND CADMIUM SULFIDE COPPER-INDIUM-DISELENIDE SOLAR CELLS
G. Noel, N. Richard, and G. Gaines Aug. 1984 119 p refs
(Contract DE-AC02-83CH-10098)
(DE85-002902; SERI/STR-211-2459) Avail: NTIS HC A06/MF A01

Groups of high efficiency cadmium sulfide/copper sulfide solar cells were exposed to combinations of stresses designed to isolate and accelerate intrinsic degradation mechanisms. Stresses included elevated temperature, illumination intensity, and cell loading conditions. All stress exposures and tests were conducted in a benign (high purity argon) atmosphere. Two primary intrinsic modes of degradation were identified: degradation of the open circuit voltage under continuous illumination and nonzero loading was found to be self recovering upon interruption of illumination or upon shorting or reverse biasing the cells. It was attributed to traps in the depletion region. Recovery from decay of light generated current was not spontaneous but could be partially accomplished by annealing in a reducing (hydrogen) environment. It was attributed to changes in the stoichiometry of the copper sulfide under the influence of electric fields and currents. DOE

N85-25948# Argonne National Lab., Ill. Chemistry Div.
EIGHT DOE SOLAR PHOTOCHEMISTRY RESEARCH CONFERENCE: PROCEEDINGS
Mary E. Gress, ed. Nov. 1984 214 p refs Conf. held in Lake Geneva, Wisc., 11-14 Jun. 1984
(Contract W-31-109-eng-38)
(DE85-005094; ANL-84-95; CONF-8406218) Avail: NTIS HC A10/MF A01

The annual meeting on solar photochemistry which brings together contractors of the Division of Chemical Sciences in its basic research program on solar photochemical energy conversion to exchange information and to give government officials an opportunity for assessment of the current status of the program is reported. The different topics which were discussed are presented. DOE

N85-25949# California Univ., Berkeley. Lawrence Berkeley Lab.
DEGRADATION PHENOMENA IN SOLID ELECTROLYTES Thesis
D. C. Hitchcock Nov. 1984 183 p refs
(Contract DE-AC03-76SF-00098)
(DE85-007066; LBL-18710) Avail: NTIS HC A09/MF A01

The critical current density above which degradation occurs in beta-alumina was determined by means of acoustic emissions tests on sodium/sulfur cells. Cells were tested by passing a current which increased linearly with time, as the stress or strain is increased in mechanical testing. The critical current density was found to depend on the rate of increase of the current density, indicating that some type of time dependent degradation is occurring. Microstructural investigation of used electrolytes showed some dissolution of electrolyte from inside cracks, and some used electrolytes had a degraded layer on the sodium exit surface, again indicating some type of time dependent attack. The degradation is attributed to mechanical cracking due to Poiseuille pressure as sodium flows out of surface flaws during charging at high current density. At low current density, long time chemical attack due to changes in the composition of the sodium electrode becomes important. Crack velocity as a function of crack length and current density is estimated for this stress corrosion. DOE

N85-25950# Southern Methodist Univ., Dallas, Tex.
THIN FILM CADMIUM TELLURIDE AND ZINC PHOSPHIDE SOLAR CELLS
T. Chu Oct. 1984 45 p
(Contract DE-AC02-83CH-10098)
(DE85-002904; SERI/STR-211-2441) Avail: NTIS HC A03/MF A01

The deposition of cadmium telluride films by direct combination of the cadmium and tellurium vapor on foreign substrates is described. Nearly stoichiometric p-type cadmium telluride films and arsenic-doped p-type films were prepared reproducibly. Major efforts were directed to the deposition and characterization of heterojunction window materials, indium tin oxide, fluorine-doped tin oxide, cadmium oxide, and zinc oxide. A number of heterojunction solar cells were prepared, and the best thin-film ITO/CdTe solar cells had an AMI efficiency of about 7.2%. Zinc phosphide films were deposited on W/steel substrated by the reaction of zinc and phosphine in a hydrogen flow. Films without intentional doping had an electrical resistivity on the order of 10(6) ohm-cm, and this resistivity may be reduced to about 5 x 10(4) ohm-cm by adding hydrogen chloride or hydrogen bromide to the reaction mixture. Lower resistivity films are deposited by adding a controlled amount of silver nitrate solution on to the substrate surface. Major efforts are directed to the deposition of low-resistivity zinc selenide to prepare ZnSe/An3P2 heterojunction thin-film solar cells. The zinc selenide films deposited by vaccum evaporation and chemical vapor deposition techniques are all of high resistivity. DOE

N85-25951*# Solarex Corp., Rockville, Md.
PROCESS RESEARCH ON POLYCRYSTALLINE SILICON MATERIAL (PROPSM) Final Technical Report
J. S. Culik and C. Y. Wrigley 1984 39 p refs
(Contracts NAS7-100; JPL-956698)
(NASA-CR-175761; DOE/JPL-956698-84/4; NAS 1.26:175761; DE85-006570) Avail: NTIS HC A03/MF A01 CSCL 10A

Results of hydrogen-passivated polycrystalline silicon solar cells are summarized. Very small grain or short minority-carrier diffusion length silicon was used. Hydrogenated solar cells fabricated from this material appear to have effective minority-carrier diffusion lengths that are still not very long, as shown by the open-circuit voltages of passivated cells that are still significantly less than those of single-crystal solar cells. The short-circuit current of solar cells fabricated from large-grain cast polycrystaline silicon is nearly equivalent to that of single-crystal cells, which indicates long bulk minority-carrier diffusion length. However, the open-circuit voltage, which is sensitive to grain boundary recombination, is sometimes 20 to 40 mV less. The goal was to minimize variations in open-circuit voltage and fill-factor caused by defects by passivating these defects using a hydrogenation process. Treatments with molecular hydrogen showed no effect on large-grain cast polycrystaline silicon solar cells. DOE

N85-25952# Stuttgart Univ. (West Germany). Inst. Fuer Statik und Dynamik.
A NOVEL TYPE OF STAYED TOWER FOR WIND TURBINES [EIN NEUARTIGER ABGESPANNTER TURM FUER WINDTURBINEN]
J. H. Argyris, K. A. Braun, and H. Fischer 1983 49 p ref In GERMAN; ENGLISH summary
(Contract BMFT-03E-4406-B)
(ISD-295; ISSN-0170-6071) Avail: NTIS HC A03/MF A01

Wind turbine tower base optimization by variation of the geometry of the stays was investigated. For a tower of 15 m in height, the geometry of the stays is optimized in such a way that the curve described by the top of the tower gets a good approximation of a horizontal circle and is technicaly reasonable. The modification for an inclined base and the countermeasures against a setting of the base of one of the cables is shown. The consequences of the rupture of different cables for the kinematics of the tower are discussed. Author (ESA)

N85-25953# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Technische Physik.
SOLAR HOUSE, FREIBURG Final Report, Jul. 1983
Klaus Vanoli (IST-Energietechnik GmbH) and Konrad Schreitmueller Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 208 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-249; ISSN-0340-7608) Avail: NTIS HC A10/MF A01; Fachinformatiionszentrum, Karlsruhe, West Germany DM 37.50

In a 12-family-appartment house with improved thermal insulation, the realistic operation of two solar Domestic Hot Water (DHW) and heating systems with evacuated tubular collectors was analyzed for 6yr. The evacuated collectors operate reliably and show no degradation. With annual collection efficiencies of up to 51%, the collectors deliver a solar contribution of 60% to 67% of the DHW-load. Annual system efficiencies range from 39% to 42% corresponding to 420 to 500 kWh/sqm/yr useful solar energy. The specific energy consumption for heating is 10.2 l of heating oil/sqm/yr (heated floor area 652 sqm); net energy requirement is 57,270 kWh/yr. Due to its low size (5% of the total living area) the collector field used for space heating contributes only 12% of the heating load. Evacuated tubular collectors in DHW-systems improve solar system efficiency by a factor of two relative to conventional systems. Author (ESA)

N85-25954# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany). Abt. ERN.
TESTING AND FURTHER DEVELOPMENT OF A SOLAR ABSORPTION COOLING PLANT Final Report, Dec. 1983
Karl Amannsberger, Hans Heckel, Josef Kreutmair, and Karl-Heinz Weber Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 105 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-264; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22

Ammonia water absorption cooling units using the process heat of line-focusing solar collectors were developed and tested. Reduction of the evaporation temperature to minus 10 C; development of an air-cooled rectifying device for the refrigerant vapor; dry cooling of absorber and condenser by natural draft; refrigerating capacities of 14 to 10 kW which correspond to air temperatures of 25 to 40 C and 24 kW power consumption to heat the machine; auxiliary power requirement < 450 W; full compatibility with changing heat input and air temperature, adaptation by automatic stabilization effects; and power optimization under changing boundary conditions by a simple regulating procedure independent of auxiliary power are achieved. The dynamic behavior of the directly linked collector-refrigeration machine system was determined. Operating conditions, market, and economic viability of solar cooling in third-world countries are described. Ice production procedures using absorption cooling units are demonstrated. Author (ESA)

N85-25335# Joint Publications Research Service, Arlington, Va.
SELECTION OF OPTIMAL CONTROL PROGRAM FOR SOLAR CELL PANELS OF EARTH SATELLITES Abstract Only
V. I. Ogarkov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 96-97 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 1, Jan.-Feb. 1984 p 44-52 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25646# Joint Publications Research Service, Arlington, Va.
BIOENERGY, SOLAR BIOTECH RESEARCH IN FRANCE, EUROPE
M. F. Chevallier and R. Nussbaum *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-010) 27 Mar. 1985 p 10-29 refs Transl. into ENGLISH from Biofutur (Paris), Nov. 1983 p 27-36 (For primary document see N85-25644 15-31)
Avail: NTIS HC A04/MF A01

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N85-25955 Central Electricity Generating Board, London (England).
OPERATIONAL METHODS FOR CALCULATING ATMOSPHERIC DISPERSION
A. Doury 7 Mar. 1985 28 p refs Transl. into ENGLISH from Radioprotection (France), v. 17, no. 2, 1982 p 83-97
(BLL-CE-Trans-8040-(9022.09)) Avail: British Library Lending Div., Boston Spa, England

At the operational level, especially at the most important stages of plant design and prevention of exceptional operational circumstances, the use of tools to assess atmospheric dispersion quantitatively cannot be avoided. On the basis of the latest practices, it is demonstrated that the present situation is not as uncomfortable for a large number of users as might be feared. Some proven operational methods are presented together with their limits, and a few simplified equations are given in order to quickly supply useful orders of magnitude either for a quick approximative validation of a model or for emergency action when computing facilities and precise meteorological data are lacking. Author

N85-25956*# SRI International Corp., Menlo Park, Calif. Chemical Physics Lab.
THE SOURCE OF STRATOSPHERIC NO AND N2O Final Report, 1 Jun. 1983 - 15 Jul. 1984
Tom G. Slanger 1 Aug. 1984 38 p refs Prepared for JPL
(Contracts NAS7-100; JPL-956064; SRI Proj. PYD-3411)
(NASA-CR-175713; JPL-9950-1062; NAS 1.26:175713; MP-84-121) Avail: NTIS HC A03/MF A01 CSCL 13B

The photodissociation of O3 was investigated as a possible sources of N2O production in the stratosphere. Photolysis was conducted at 1576 A to generate the excited O2 states that react with N2 to form N2O. At this wavelength, there is a quantum yield of two for prompt production of oygen atoms, which is a consequence of the existence of two photodissociative channels giving comparable yields. One of these channels gives O(D1) and O2(b1sigma(+)subg), with a quantum yield of 0.6, whereas the other results in fragmentation of the O3, with production of three ground state oxygen atoms. The O2(b) is generated with vibrational excitation, and there are comparable populations in levels O to 3. These observations are the first to show O2(b) production from any photodissociative process, and were made under conditions in which the kinetics of vibrationally excited O2(b) can be studied. It appears that O3 photodissociation at 1576 A is not a good system for generating the higher electronic states of O2; it is likely that better results will be obtained at 1930 A. Author

N85-25957# New South Wales Univ., Kensington (Australia).
A STUDY OF THE METHODS FOR EVALUATING THE NOISE IMPACT OF A PROPOSED AIRPORT ON A COMMUNITY M.S. Thesis. Abstract Only
Peter John Griffiths [1984] 3 p
Avail: NTIS HC A02/MF A01

This project compares six different methods of evaluating the noise impact of a proposed airport. This comparison is made in terms of land use plans based on aircraft noise exposure. Land use plans are developped from community levels of annoyance correllated with some method of describing the noise exposure. The general principles and assumptions used in developing aircraft noise rating procedures are discussed. From this discussion, six indices are selected and used to assess the impact of aircraft noise on an area surrounding a (formerly) proposed site. B.W.

N85-25958# Marine Biological Lab., Woods Hole, Mass. Ecosystems Center.
THE ECOLOGY OF TUNDRA PONDS OF THE ARCTIC COASTAL PLAIN: A COMMUNITY PROFILE
John E. Hobbie Jun. 1984 66 p refs
(TI85-900650; FWS-OBS-83/25; LC-84-601022; PB85-155679) Avail: NTIS HC A04/MF A01

The Arctic Coastal Plain is a flat or gently rolling area of tundra which covers the entire coastal region of northern Alaska. The grasses, sedges, and waterbodies are covered with ice, snow, and silence for 9 months of the year, but lakes, ponds, marshes, and birds abound for the brief summer. The communities and ecological processes are described. The Arctic Coastal Plain the types of wetland habitat are descussed. The pysical and chemical environment is described with special emphasis on the controlling influence of the permafrost and of the phosphorus cycle. The plants and animals and their seasonal abundance are detailed. The food chains, the cycling of carbon, energy flow, and the controls acting on wetland systems are discussed. Human affects on ponds, wetlands, and their processes are described. E.A.K.

N85-25959# Comptroller General of the United States, Washington, D.C.
AN ANALYSIS OF ISSUES CONCERNING ACID RAIN, REPORT TO THE CONGRESS OF THE UNITED STATES
11 Dec. 1984 207 p refs
(TI85-901070; GAO/RCED-85-13; B209020) Avail: NTIS HC A10/MF A01

The issues involved in the decision making on controlling acid deposition, referred to as acid rain were examined. The availablity of scientific information and whether it indicates either that it is appropriate to begin control action now, or that control actions should await better understanding is studied. It is found that the scientific information alone does not lead unequivocally to either decision. The current state of knowledge on the subject is analyzed and a series of observations on what that knowledge does indicate about actions to control acid deposition are presented. DOE

N85-25960# California Univ., Livermore. Lawrence Livermore Lab.
RESULTS OF RECENT LARGE-SCALE NH3 AND N2O4 DISPERSION EXPERIMENTS
R. P. Koopman, T. G. McRae, H. C. Goldwire, Jr., D. L. Ermak, and E. J. Kansa Nov. 1984 26 p refs Presented at the 3rd Symp. on Heavy Gases and Risk Assessment, Bonn, 12-13 Nov. 1984
(Contract W-7405-eng-48)
(DE85-004988; UCRL-91830; CONF-8411134-2) Avail: NTIS HC A03/MF A01

Large scale spill tests of ammonia (NH3) and nitrogen tetroxide (N2O4) were performed. The tests were extensively instrumented, resulting in large amounts of data which can be used to quantitatively describe the observed phenomena. Preliminary results from both test series indicate that aerosols play a very important role in dense gas dispersion. The test data are ideally suited for model validation, and several example model data comparisons are included. Gaussian model calculations are found to be inadequate even at long distances downwind. New and unexpected phenomena are observed and discussed. E.A.K.

N85-25961# Oak Ridge National Lab., Tenn. Enviromental Sciences Div.
A COMPARATIVE EVALUATION OF THE EFFECTS OF ACID PRECIPITATION, NATURAL ACID PRODUCTION AND HARVESTING OF CATION REMOVAL FROM FORESTS
Dale W. Johnson 1984 12 p refs Presented at the Natl. Acid Precipitation Assessment Program Meeting, Asheville, N. Car., 13 Nov. 1984
(DE85-005254; CONF-8411137-4) Avail: NTIS HC A02/MF A01

The effects of acid deposition, natural leaching and harvesting on base cation export from forests in Maine, Tennessee, South Carolina, North Carolina, and Washington were compared. It is shown that atmospheric deposition added at least 50 to 100% to natural leaching rates in study sites in the eastern United States, but only 1 to 2% in western Washington. Sulfate flux accounted for 30 to 80% of total cation leaching in sites in the eastern United States, and only 3 to 12% of leaching in the Washington sites. Nitrate leaching was negligible in all but a red alder site where net NO3(-) leaching is caused by excess nitrogen fixation. Total base cation export by leaching exceeded Ca(2+) + Mg(2+) + K(+) export due to whole tree harvesting in all but one site. Some sites show a net Ca(2+) or K(+) accumulation from atmospheric deposition until they are subjected to whole tree harvesting. It is concluded that leaching need not cause a net export of all nutrient cations even if total base cation export is accelerated by acid deposition. DOE

N85-25962# Argonne National Lab., Ill. Environmental Research Div.
FIELD VALIDATION OF 6-PARTICLE PUFF MODEL
C. M. Sheih 1984 18 p refs Presented at the DOE Model Validation Workshop, Charleston, S.C., 23 Oct. 1984
(Contract W-31-109-eng-38)
(DE85-004073; CONF-8410165-3) Avail: NTIS HC A02/MF A01

Simulations with a puff dispersion model for atmospheric pollutants were compared with field data from the Mesoscale Atmospheric Transport Studies. The model treats a plume from a continuous source as a series of puffs emitted from the source. Each puff is represented by a set of six tracer particles, which define the size, shape and location of the puff. Initially, these particles are located at the surface of the source, on arbitrarily chosen orthogonal axes. The new locations of the particles are computed at each time step by taking into account advection, eddy diffusion, wind shear and entrainment of ambient air during puff rise. Calculations of puff rise are carried out by solving conservation equations of mass, momentum, and energy with a finite difference method. Fourteen tracer releases were simulated, with a correlation coefficient between observed and simulated peak concentrations of 0.57. The average simulated peak concentration was 18% larger than the average observed peak concentration, while the standard deviation of the simulated peak concentration was 81% of the observed peak concentration. DOE

N85-25963# California Univ., Los Angeles. School of Engineering and Applied Science.
SIZE DISTRIBUTIONS OF ELEMENTAL CARBON IN ATMOSPHERIC AEROSOLS
A. H. Miguel (Pontifica Univ. Catolica do Rio de Janeiro) and S. K. Friedlander Jan. 1985 9 p refs
(Grant EPA-R-801455)
(PB85-153534; EPA-600/D-85-003) Avail: NTIS HC A02/MF A01 CSCL 13B

Because of the importance played by particulate elemental carbon (PEC) on climatic impact, the size distribution of PEC was examined in samples collected in an urban area, inside the air duct of an urban tunnel, and next to the take off runway of a busy airport. Besides providing needed data to improve the precision of calculations of potential local and global environmental effects, the PEC size distributions reported facilitate the understand-

ing the mechanicsm of association of PEC and polycyclic aromatic hydrocarbons (PAHs), a class of organic compounds that include several mutagens. GRA

N85-25964# Battelle Columbus Labs., Ohio.
DIESEL ENGINE EMISSIONS OF PARTICULATES AND ASSOCIATED ORGANIC MATTER Annual Report
B. A. Petersen, T. A. Bishop, C. C. Chuang, and D. A. Trayser 15 Apr. 1984 143 p
(PB85-154425; CRC-APRAC-CAPE-24-72-05; AR-3) Avail: NTIS HC A07/MF A01 CSCL 07D

An engine test facility and an analytical method for measuring polynuclear aromatic hydrocarbon (PNA) in diesel exhaust particulate was developed. The analytical method was validated the exhaust gas and dilution air mixing, was refined, and the influence of several dilution system variables on engine PNA measurements was evaluated. A statistical analysis of the results identified several areas that needed to be investigated further prior to additional studies. Whether the true engine PNA emitted to dilution tunnel can be accurately determined within the ranges of dilution tunnel conditions and engine modes tested is being determined. GRA

N85-25965# Office of Technology Assessment, Washington, D.C.
PROTECTING THE NATION'S GROUNDWATER FROM CONTAMINATION, VOLUME 1
Oct. 1984 245 p 2 Vol.
(PB85-154201; OTA-O-233; LC-84-601126) Avail: NTIS HC A11/MF A01 CSCL 08H

The current status of the Nation's knowledge and experience in dealing with groundwater contamination problems is assessed. Existing contamination problems are pointed out and recognized that the prevention of future contamination needs to be explicitly considered to develop a policy framework for comprehensive resource protection; as experience with hazardous wastes has shown the cost to clean up contamination can be enormously greater than the cost to prevent contamination. The concept of protection groundwater quality, comprised of activities to detect, correct and prevent groundwater contamination is studied. GRA

N85-25966# Office of Technology Assessment, Washington, D.C.
PROTECTING THE NATION'S GROUNDWATER FROM CONTAMINATION, VOLUME 2
Oct. 1984 271 p 2 Vol.
(PB85-154219; OTA-O-276) Avail: NTIS HC A12/MF A01 CSCL 08H

The current status of the Nation's knowledge and experience in dealing with groundwater contamination problems was assessed. The study focuses on existing contamination problems, while recognizing that the prevention of future contamination would also need to be explicity considered in order to develop a policy framework for comprehensive resource protection; for example, as experience with hazardous wastes has shown the cost to clean up contamination can be enormously greater than the cost to prevent contamination. The protection of ground water quality, activities to detect, correct and prevent groundwater contamination are studied. GRA

N85-25967# Council for Scientific and Industrial Research, Pretoria (South Africa).
PAPERS FROM THE SYMPOSIUM ON EMISSIONS: THE VALUE OF INCENTIVES AND GUIDELINES FOR CONTROL
N. Boegman, M. M. Bulley, S. M. Lloyd, and J. R. VanDeventer 17 Nov. 1983 64 p refs In ENGLISH and AFRIKAANS Conf. held in Pretoria, 17 Nov. 1983 Sponsored in part by the National Association for Clean Air
(S-336; ISBN-0-7988-2830-7) Avail: NTIS HC A04/MF A01

The control of air pollution in South Africa has progressed remarkably well since the passage of the Atmospheric Pollution Prevention Act of 1965; however, there is a lack of understanding and insight regarding the intentions of the legislators. Various aspects are put in perspective, and recommendations to facilitate the continued effective implementation of the legislation are offered. Incentives for industrialists in other countries are reviewed to reduce atmosphere emissions to levels lower than the legal limits are. A set of guidelines on minimum requirements and permissible emission limits developed for each of the 67 Scheduled Processes, guidelines are used very successfully to implement a uniform policy of control on a national basis. Incentives for improved performance, design and siting of factories owned by large growing industries are covered with the psychological basis of motivation for action is given as background. The significance of the public attitude towards clean air and the role of the media is discussed. A.R.H.

N85-26593*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IS THERE MORE THAN ONE STEADY STATE FOR NOx?
George Bakas *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 15-18 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 13B

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N85-25968 Florida State Univ., Tallahassee.
RESONANCE GENERATION OF INERTIAL WAVES (IN THE ATMOSPHERE) BY DOPPLER-SHIFT OF INERTIO-GRAVITY MODES Ph.D. Thesis
Mohamed Amrani-Hanchi 1984 152 p
Avail: Univ. Microfilms Order No. DA8501822

Inertio-gravity waves having periods between 6 and 17 hours, horizontal wavelengths between 800 and 1250 km and vertical wavelengths between 1200 and 1600 were isolated from data obtained during 200 highly accurate balloon soundings. A stability analysis shows that these waves are generated in the troposphere by a mixed inertia-shear instability and propagate upwards in the stratosphere. Evidence is presented to prove the existence of inertial waves in the atmosphere as well as the mechanism by which they are generated. It is also shown that flux divergence of heat and momentum within this lower range of the inertio-gravity wave spectrum is not capable of transporting momentum upwards into the mesosphere to bring about the kind of temperature gradient and wind reversals in the context of the Holton-Matsuno theory. The wave spectrum is found to follow a -5/3 inertial subrange slope with an energy cascade towards high wavenumbers. The universal consant a is found to lie between 1.5 and 11. Dissert. Abstr.

N85-25969 Wisconsin Univ., Madison.
NUMERICAL EXPERIMENTS OF JET STREAK AGEOSTROPHIC CIRCULATIONS USING PSEUDO-GEOSTROPHIC INITIALIZATION AND PERSPECTIVES Ph.D. Thesis
Tommy Lee Black 1984 214 p
Avail: Univ. Microfilms Order No. DA8424499

The ageostrophic circulations and associated adjustment near a propagating jet streak are examined using a hybrid isentropic-sigma coordinate numerical model. The concept of pseudo-geostrophic balance is discussed followed by the description of a method of wind initialization based on this concept. Using this initialization technique a series of numerical simulations was carried out. In each case, a dynamical property was altered and the subsequent development of the system contrasted with that of a 'standard' case. The properties investigated include the absolute vorticity, the static stability, and a synoptic scale wave structure. Dry vs. moist conditions were compared in each case. The effects of viscosity and horizontal resolution were also considered. Dissert. Abstr.

N85-25970*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

SAM 2 MEASUREMENTS OF THE POLAR STRATOSPHERIC AEROSOL, VOLUME 5 Report, Oct. 1980 - Apr. 1981
M. Patrick McCormick and David Brandl (Systems and Applied Sciences Corp., Hampton, Va.) May 1985 78 p refs
(NASA-RP-1140; L-15947; NAS 1.61:1140) Avail: NTIS HC A05/MF A01 CSCL 04A

The Stratospheric Aerosol Measurement (SAM) 2 sensor is aboard the Earth-orbiting Nimbus 7 spacecraft providing extinction measurements of the Antarctic and Arctic stratospheric aerosol with a vertical resolution of 1 km. Representative examples and weekly averages of aerosol data and corresponding temperature profiles for the time and place of each SAM 2 mesurement (Oct. 1980 through Apr. 1981) are presented. Contours of aerosol extinction as a function of altitude and longitude or time are plotted and weekly aerosol optical depths are calculated. Seasonal variations and variations in space (altitude and longitude) for both polar regions are easily seen. Stratospheric optical depths are 0.002 to 0.003 for the Antarctic region and 0.005 to 0.006 at the beginning to 0.002 to 0.003 at the end of the time period for the Arctic region. The Northern Hemisphere values are quite large due mainly to the eruption of Mount St. Helens (46.2 deg N, 122.2 deg W) in May 1980. Polar stratospheric clouds at altitudes of about 20 km were observed during the Arctic winter. A ready-to-use format containing a representative sample of the fifth 6 months of data to be used in atmospheric and climatic studies is presented. B.W.

N85-25971*# Institute for Atmospheric Optics and Remote Sensing, Hampton, Va.
DEVELOPMENT OF GLOBAL MODEL FOR ATMOSPHERIC BACKSCATTER AT CO2 WAVELENGTHS Final Report
G. S. Kent, P. H. Wang, U. Farrukh, A. Deepak, and E. M. Patterson (Georgia Inst. of Tech.) Mar. 1985 425 p refs
(Contract NAS8-35594)
(NASA-CR-175679; NAS 1.26:175679; IFAORS-TR-242) Avail: NTIS HC A18/MF A01 CSCL 04A

The improvement of an understanding of the variation of the aerosol backscattering at 10.6 micron within the free troposphere and the development model to describe this was undertaken. The analysis combines theoretical modeling with the results contained within three independent data sets. The data sets are obtained by the SAGE I/SAM II satellite experiments, the GAMETAG flight series and by direct backscatter measurements. The theoretical work includes use of a bimodal, two component aerosol model, and the study of the microphysical and associated optical changes occurring within an aerosol plume. A consistent picture is obtained, which describes the variation of the aerosol backscattering function in the free troposphere with altitude, latitude, and season. Most data are available and greatest consistency is found inside the Northern Hemisphere. E.A.K.

N85-25972*# National Aeronautics and Space Administration, Washington, D. C.
SELECTION OF A MODEL OF EARTH'S ALBEDO RADIATION, PRACTICAL CALCULATION OF ITS EFFECT ON THE TRAJECTORY OF A SATELLITE
J. J. Walch Apr. 1985 16 p refs Transl. into ENGLISH of "Choix d'un Modele de Rayonnement d'Albedo Terrestre, Calcul Pratique de son Effet sur la Trajectoire d'un Satellite" Grasse, France p 1-10 By Kanner (Leo) Associates, Redwood City, Calif. Original Doc. Prep. by Centre d'Etudes et de Recherches Geodynamiques et Astronomiques
(Contract NASw-4005)
(NASA-TM-77870; NAS 1.15:77870) Avail: NTIS HC A02/MF A01 CSCL 04A

Theoretical models of Earth's albedo radiation was proposed. By comparing disturbing accelerations computed from a model to those measured in flight with the CACTUS Accelerometer, modified according to the results. Computation of the satellite orbit perturbations from a model is very long because for each position of this satellite the fluxes coming from each elementary surface of the terrestrial portion visible from the satellite must be summed. The speed of computation is increased ten times without significant loss of accuracy thanks to a stocking of some intermediate results. Now it is possible to confront the orbit perturbations computed from the selected model with the measurements of these perturbations found with satellite as LAGEOS. Author

N85-25973*# Hawaii Univ., Honolulu. Planetary Geophysics Div.
SPECTRAL REFLECTANCE OF CARBONATE MINERALS AND ROCKS IN THE VISIBLE AND NEAR INFRARED (0.35 - 2.55 MICRONS) AND ITS APPLICATIONS IN CARBONATE PETROLOGY
Susan Jenks Gaffey Aug. 1984 256 p refs
(Contract JPL-956370; Grant NsG-7312)
(NASA-CR-175763; NAS 1.26:175763) Avail: NTIS HC A12/MF A01 CSCL 08G

Reflection spectroscopy in the visible and near infrared (0.35 to 2.55 micron) offers a rapid, inexpensive, nondestructive tool for determining the mineralogy and investigating the minor element chemistry of the hard-to-discriminate carbonate minerals, and can, in one step, provide information previously obtainable only by the combined application of two or more analytical techniques. When light interacts with a mineral certain wavelengths are preferentially absorbed. The number, positions, widths and relative intensities of these absorptions are diagnostic of the mineralogy and chemical composition of the sample. At least seven bands due to vibrations of the carbonate radical occur between 1.60 and 2.55 micron. Positions of these bands vary from one carbonae mineral to another and can be used for mineral identification. Cation mass is the primary factor controlling band position; cation radius plays a secondary role. Author

N85-25974*# Science and Technology Corp., Hampton, Va.
DEVELOPMENT OF ALGORITHMS FOR USING SATELLITE METEOROLOGICAL DATA SETS TO STUDY GLOBAL TRANSPORT OF STRATOSPHERIC AEROSOLS AND OZONE Final Report
Pi-Huan Want and Adarsh Deepak Mar. 1985 112 p refs
(Contract NAS1-16362)
(NASA-CR-172540; L-2017; NAS 1.26:172540) Avail: NTIS HC A06/MFen1] A01 CSCL 04A

The utilization of stratospheric aerosol and ozone measurements obtained from the NASA developed SAM II and SAGE satellite instruments were investigated for their global scale transports. The stratospheric aerosols showed that during the stratospheric warming of the winter 1978 to 1979, the distribution of the zonal mean aerosol extinction ratio in the northern high latitude exhibited distinct changes. Dynamic processes might have played an important role in maintenance role in maintenance of this zonal mean distribution. As to the stratospheric ozone, large poleward ozone transports are shown to occur in the altitude region from 24 km to 38 km near 55N during this warming. This altitude region is shown to be a transition region of the phase relationship between ozone and temperature waves from an in-phase one above 38 km. It is shown that the ozone solar heating in the upper stratosphere might lead to enhancement of the damping rate of the planetary waves due to infrared radiation alone in agreement with theoretical analyses and an earlier observational study. E.A.K.

N85-25975# Kakioka Magnetic Observatory (Japan).
REPORT OF THE GEOMAGNETIC AND GEOELECTRIC OBSERVATIONS, 1983 (RAPID VARIATIONS) Annual Report
1984 45 p
(Rept-24) Avail: NTIS HC A03/MF A01

The observational results of geomagnetic and geoelectric rapid variations at Kakioka, Memambetsu and Kanoya are given. The results of rapid variations and copies of records of the rapid run induction magntograms and rapid-run tellurigrams are given. R.J.F.

N85-25976*# Alabama Univ., Huntsville. School of Science.
PLASMA AND MAGNETOSPHERIC RESEARCH Quarterly Progress Report, Jan. - Mar. 1985
Richard H. Comfort and James L. Horwitz Apr. 1985 15 p refs

(Contract NAS8-33982)
(NASA-CR-171447; NAS 1.26:171447) Avail: NTIS HC A02/MF A01 CSCL 04A

Progress is reported in the development of programs for statistical analysis of boundary and structure type files based on surveys of Dynamics Explorere data. Programs being used for handling data on plasma boundaries in the inner magnetosphere, the structure of the plasmasphere, and the heavy ion torus may be useful for determining statistics on the warm plasma cloak and the auroral ion fountain. Data analysis and modeling; spacecraft sheath effects; and laboratory plasma flow studies are discussed.
A.R.H.

N85-25977# Ben Gurion Univ. of the Negev, Sede Boqer (Israel). Inst. for Desert Research.
THE BEHAVIOR OF THE ATMOSPHERE IN THE DESERT PLANETARY BOUNDARY LAYER Final Scientific Report, 15 Oct. 1983 - 14 Oct. 1984
L. Berkofsky 14 Oct. 1984 81 p
(Grant AF-AFOSR-0036-84)
(AD-A151286; AFOSR-85-0227TR) Avail: NTIS HC A05/MF A01 CSCL 04/1

One of the aims of this investigation was to develop a limited area planetary boundary layer desert model for computers of limited power. We derived a general system of vertically integrated equations, including a dust concentration equation and an inversion height equation. The boundary layer was divided into a constant flux layer, a transition layer, and an inversion layer. The model equations predict the mean (vertically averaged) winds in the transition layer, the potential temperature at the top of the surface layer, the potential temperature at the ground, the height of the inversion layer, the dust concentration at the top of the surface layer, the moisture at the top of the surface layer, and the soil moisture at the ground. The radiation flux is also calculated as a function of time. Initially, the one-dimensional version was tested (no horizontal advection). All fields showed reasonable evolution for a 24 hour prediction. Data (dust concentration, inversion height) are now being gathered for verification. The two dimensional version was first run with a time step of two minutes and boundary conditions held fixed in time. Although the interior fields, starting from artificial initial data, developed reasonably, the calculations blew up after 4 hours, probably due to the restrictive boundary conditions. When the radiation boundary conditions were used, the model ran for 6 hours, did not blow up, but developed unrealistically near the boundaries.
GRA

N85-25978# Teledyne Geotechnical, Alexandria, Va.
FREQUENCY DEPENDENCE OF Q IN THE MANTLE UNDERLYING THE SHIELD AREAS OF EURASIA Final Technical Report, 15 Nov. 1982 - 30 Dec. 1984
Z. A. Der, A. C. Lees, V. F. Cormier, L. Anderson, and J. Burnetti 11 Jan. 1985 148 p
(Contract F49620-83-C-0040; ARPA Order 4493; AF Proj. 4493)
(AD-A151367; AL-85-1; AFOSR-85-0240TR) Avail: NTIS HC A07/MF A01 CSCL 08/11

In Part I the results of short and intermediate period data analyses for the determination of a frequency dependent Q model of the mantle under the shield areas of Eurasia are presented. The spectra of short period P waves from nuclear explosions in the 1-8 Hz frequency range give t* sub p = approx. 0.15-0.2 seconds. Part II presents analyses of long period data. Long period multiple S and ScS phases observed in northern Europe were analyzed to determine mantle attenuation in the 0.02 to 0.2 Hz range under the Eurasian shield. Two groups of events are used: deep Far-Eastern earthquakes and large earthquakes near the edges of the shield areas of Eurasia. Part III provides the Q model. A large set of broad band data was analyzed to determine the frequency and depth dependence of Q for P and S waves under the northern shield areas of Eurasia. A wide range of techniques utilizing spectra, amplitude ratios and waveform modeling were used to derive apparent and absolute t* estimated for P and S waves covering the seismic band between 0.01 to 10 Hz. A supplement discusses methodologies for estimating t*(f) from Short Period Body Waves and Regional Variations of t*(f) in the United States.
GRA

N85-25290# Joint Publications Research Service, Arlington, Va.
MAGNETIC FIELD PENETRATION INTO COMETARY IONOSPHERE Abstract Only
Z. M. Ioffe *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 15-16 Transl. into ENGLISH from Astronomicheskiy Zh. (USSR), v. 61, no. 4, Jul.-Aug. 1984 p 812-814 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25291# Joint Publications Research Service, Arlington, Va.
OBSERVATION OF POLAR AURORA FROM THE SALYUT-6 SPACE STATION DURING THE GREAT GEOMAGNETIC STORM OF 11-13 APR. 1981 Abstract Only
A. I. Lazarev, V. V. Kovalenok, and L. S. Yevlashin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 16 Transl. into ENGLISH from Geomagnetizm i Aeronomiya (USSR), v. 24, no. 4, Jul.-Aug. 1984 p 620-624 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25296# Joint Publications Research Service, Arlington, Va.
USE OF ATMOSPHERIC MODELS IN PREDICTING ARTIFICIAL EARTH SATELLITE MOTION Abstract Only
O. A. Malkin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 20 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geodiziya i Aerofotosyemka (USSR), no. 3, May-Jun. 1984 p 44-49 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25300# Joint Publications Research Service, Arlington, Va.
ONE METHOD FOR CONSTRUCTING MODEL OF POINT MASSES OF PLANETARY GRAVITY FIELD Abstract Only
A. L. Tserklevich and S. D. Volzhanin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 23 Transl. into ENGLISH from Pisma v Astronomicheskiy Zh. (USSR), v. 10, no. 7, Jul. 1984 p 549-553 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25306# Joint Publications Research Service, Arlington, Va.
FAST ION POLARIZATION JET IN SUBAURORAL F-LAYER AND ITS MANIFESTATION IN STRUCTURE OF HIGH LATITUDE IONOSPHERE Abstract Only
V. M. Filippov, L. V. Shestakova, and Y. I. Galperin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 27 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 557-564 Original language document announced as A84-48008 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25307# Joint Publications Research Service, Arlington, Va.
ION KINETICS, SMALL NEUTRAL AND EXCITED COMPONENTS IN D-REGION WITH ELEVATED IONIZATION LEVEL. PART 2: VARIATIONS IN SMALL NEUTRAL AND EXCITED COMPONENTS Abstract Only
N. V. Smirnova, S. I. Kozlov, V. A. Vlaskov, and N. A. Ovchinnikov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 28 Transl. into ENGLISH from Kosmicheskiya Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 565-571 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25308# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL CHECK OF ION TRANSPORT MECHANISM IN EARTH'S RADIATION BELT WITH EXPOSURE TO NONSTEADY-STATE ELECTRIC FIELDS Abstract Only
M. I. Panasyuk *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 29 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 572-587 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25311# Joint Publications Research Service, Arlington, Va.
MAGNETOHYDRODYNAMICS OF EARTH'S BOW SHOCK Abstract Only
V. G. Yeselevich *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 31-32 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 599-608 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25314# Joint Publications Research Service, Arlington, Va.
MODELING LONGITUDINAL MOTIONS OF THERMAL O+ AND H+ IONS IN MAGNETIC FIELD TUBE CONVECTIVE THROUGH DAYTIME POLAR CUSP Abstract Only
L. V. Zinin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 34 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 629-631 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25315# Joint Publications Research Service, Arlington, Va.
ELECTRON FLUX WITH ELECTRON ENERGIES ABOVE 40 MeV AT ALTITUDES OF ABOUT 500 km IN REGION WHERE CAPTURE IS POSSIBLE AND OUTSIDE IT WHEN L IS 3 OR GREATER Abstract Only
L. V. Kurnosova, L. A. Razorenov, and M. I. Fradkin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 35 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 632-634 Original language document annouced as A84-48019 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25316# Joint Publications Research Service, Arlington, Va.
BOUNDARY OF MODULATION DIFFUSION AND STOCHASTIC INSTABILITY OF HIGH ENERGY PROTONS IN INNER RADIATION BELT Abstract Only
I. V. Amirkhanov, A. A. Gusev, V. D. Ilin, A. N. Ilina, and G. I. Pugacheva *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 35-36 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 634-637 Original language document announced as A84-48020 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25339# Joint Publications Research Service, Arlington, Va.
RESEARCH ON ATMOSPHERIC DUST FORMATIONS USING SATELLITE OBSERVATION DATA Abstract Only
M. V. Ivanchik, S. I. Klyushnikov, V. A. Krovotsyntsev, and A. N. Serebrennikov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 106 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 14-17 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25345# Joint Publications Research Service, Arlington, Va.
EVALUATING RADIATION DISTORTIONS OF OPTICAL IMAGE OF EARTH'S SURFACE IN HORIZONTALLY INHOMOGENEOUS ATMOSPHERE Abstract Only
I. V. Mishin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 111 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 72-76 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25353# Joint Publications Research Service, Arlington, Va.
INTERPRETATION OF SPACE PHOTOLINEAMENTS Abstract Only
L. N. Rozanov and I. N. Kalinina *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 117 Transl. into ENGLISH from Sov. Geol. (USSR), no. 9, Sep. 1984 p 81-83 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N85-25979 Colorado State Univ., Fort Collins.
THE PHYSICS OF THE MARINE STRATOCUMULUS-CAPPED MIXED LAYER Ph.D. Thesis
Chaing Chen 1984 227 p
Avail: Univ. Microfilms Order No. DA8427850

A one-dimensional stratocumulus model is developed to simulate the stratocumulus-capped mixed layer. The interactions among the following physical processes were investigated: cloud microphysics, turbulent mixing, vertical wind shear, atmospheric radiation, drizzle precipitation, large scale divergence, the sea surface temperature and the presence of high level clouds and the moist layer above the capping inversion. It is found that the cloud top entrainment is triggered by the vertical transport of turbulence kinetic energy and is further enhanced by evaporative cooling. It is also found that the competition between shear and radiative cooling is the key to determine whether the cloud layer is shear-driven or buoyancy-driven. The sensitivity experiments were also conducted to examine the influence of shortwave radiation on cloud layer structure. Dissert. Abstr.

N85-25980 Purdue Univ., Lafayette, Ind.
THE SOUTH PACAFIC CONVERGENCE ZONE AND ENERGY BALANCE OF THE SOUTHERN HEMISPHERE Ph.D. Thesis
Huo-Jin Huang 1984 148 p
Avail: Univ. Microfilms Order No. DA8500385

This thesis presents a diagnostic analysis of the general circulation and energy balance of the Southern Hemisphere (0-60 S) during part of FGGE SOP-1, 10-27 January, 1979. A modified set of Level 3-b grid point analyses produced by the European Centre for Medium-range Weather Forecasts and satellite-derived estimates of outgoing longwave radiation are used. One of the dominant features during this period is the South Pacific Convergence Zone (SPCZ), which consists of a semipermanent, convectively-active, slowly meandering cloud band over the South Pacific Ocean. The present study focuses on the relationship between the SPCZ and the Southern Hemisphere atmospheric circulation. A zonal Fourier analysis is applied to partition atmospheric variables into their zonal average and wave components for wave numbers(n) 1-15. Dissert. Abstr.

N85-25981 Colorado State Univ., Fort Collins.
RADIATIVE FORCING OF THE SOUTHWEST SUMMER MONSOON (A SATELLITE PERSPECTIVE) Ph.D. Thesis
Eric Alan Smith 1984 558 p
Avail: Univ. Microfilms Order No. DA8500715

This investigation examines radiative forcing withing the southwest summer monsoon. Much of the investigation utilizes meteorological satellite data to diagnose radiative exchange over the monsoon domain. A methodological study is presented involving the transformation of weather satellite spectral radiance measurements into broad band radiative flux estimates. Radiation budget processes associated with the 1979 Summer Monsoon Experiment are investigated. This study incorporated data sets from polar orbiting and geosynchronous weather satellites (TIROS-N and GOES-1), along with radiation budget measurements derived from the Nimbus-7 satellite. A review is presented of the surface energy budget problem over remote terrain. The multi-platform monitoring strategy is applied to a specific feature within the southwest monsoon domain; the Arabian heat low. Dissert. Abstr.

N85-25982 British Aerospace Dynamics Group, Bristol (England). Optics Research Dept.
COMPARISON OF SOME WEST GERMAN CLOUD HEIGHT AND VISIBILITY DATA
R. Burbidge and A. R. Tooth Dec. 1981 20 p refs
(BAe-BT-12734) Copyright. Avail: Issuing Activity

Cloud base height and visibility data for Hannover and Braunlage, a meteorological station 120 km southeast of Hannover on the East-West German border were compared. There is a higher

probability of better visibility in Braunlage than in Hannover. Low visibilities, up to 4 km, occur as frequently in Braunlage as in Hannover. There is a consistently higher probability of lower cloud base height in Braunlage; 50% of the time cloud base height is < 250 m. In Hannover cloud is < 400 m 50% of the time. The meteorological data at ground level in Braunlage is the same as at Hannover. Author (ESA)

N85-25983 British Aerospace Dynamics Group, Bristol (England). Optics Research Dept.
A BRIEF COMPARISON OF EGYPTIAN WITH WEST GERMAN ATMOSPHERIC TRANSMISSION DATA IN THE 8 TO 11.5 MICRON WAVEBAND
S. D. Searle Mar. 1982 22 p refs
(BAe-BT-12829) Copyright. Avail: Issuing Activity

Winter and summer atmospheric transmission in the 8 to 11.5 micron waveband in Egypt and West Germany was compared. The Egyptian data cannot be compared directly with that for West Germany, the different areas of Egypt must each be compared with the midlatitude data base (there is a 20% change in transmission across Egypt during summer). However, it appears that Northern Egyptian transmissions are fractionally worse than those of Germany while those in the South are better.
Author (ESA)

N85-25984*# Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
AN EARTH LONGWAVE RADIATION CLIMATE MODEL Final Report
Shi-Keng Yang Dec. 1984 197 p refs
(Contract NCC1-76)
(NASA-CR-175749; NAS 1.26:175749; Rept-020406-1-F) Avail: NTIS HC A09/MF A01 CSCL 04B

An Earth outgoing longwave radiation (OLWR) climate model was constructed for radiation budget study. Required information is provided by on empirical 100mb water vapor mixing ratio equation of the mixing ratio interpolation scheme. Cloud top temperature is adjusted so that the calculation would agree with NOAA scanning radiometer measurements. Both clear sky and cloudy sky cases are calculated and discussed for global average, zonal average and world-wide distributed cases. The results agree well with the satellite observations. The clear sky case shows that the OLWR field is highly modulated by water vapor, especially in the tropics. The strongest longitudinal variation occurs in the tropics. This variation can be mostly explained by the strong water vapor gradient. Although in the zonal average case the tropics have a minimum in OLWR, the minimum is essentially contributed by a few very low flux regions, such as the Amazon, Indonesian and the Congo. B.W.

N85-25985*# Northrop Corp., Los Angeles, Calif.
APPLICATION OF INFRARED RADIOMETERS FOR AIRBORNE DETECTION OF CLEAR AIR TURBULENCE AND LOW LEVEL WIND SHEAR, AIRBORNE INFRARED LOW LEVEL WIND SHEAR DETECTION TEST Final Report, 31 Dec. 1982 - 31 Mar. 1985
P. M. Kuhn 31 Mar. 1985 50 p refs
(Contract NAS2-10592)
(NASA-CR-175725; NAS 1.26:175725) Avail: NTIS HC A03/MF A01 CSCL 04B

The feasibility of infrared optical techniques for the advance detection and avoidance of low level wind shear (LLWS) or low altitude wind shear hazardous to aircraft operations was investigated. A primary feasibility research effort was conducted with infrared detectors and instrumentation aboard the NASA Ames Research Center Learjet. The main field effort was flown on the NASA-Ames Dryden B57B aircraft. The original approach visualized a forward-looking, infrared transmitting (KRS-5) window through which signals would reach the detector. The present concept of a one inch diameter light pipe with a 45 deg angled mirror enables a much simpler installation virtually anywhere on the aircraft coupled with the possibility of horizontal scanning via rotation of the forward directed mirror. Present infrared detectors and filters would certainly permit ranging and horizontal scanning in a variety of methods. CRT display technology could provide a contoured picture with possible shear intensity levels from the infrared detection system on the weather radar or a small adjunct display. This procedure shoud be further developed and pilot evaluated in a light aircraft such as a Cessna 207 or equivalent. Author

N85-25986*# Earth Satellite Corp., Chevy Chase, Md.
SHUTTLE IMAGING RADAR-B (SIR-B) DATA ANALYSIS FOR IDENTIFYING RAINFALL EVENT OCCURRENCE AND INTENSITY Final Report
Mar. 1985 13 p Prepared for JPL
(Contract JPL-956909)
(NASA-CR-175712; JPL-9950-1078; NAS 1.26:175712; Rept-248618-ESCO-UR) Avail: NTIS HC A02/MF A01 CSCL 04B

The utility of SIR-B data were evaluated for the detection and measurement of rainfall events, and applications of SIR-B data were developed to the improvement of existing rainfall models. During the SIR-B mission, EarthSat monitored rainfall events occurring within the conterminous United States. The GOES scenes form showed rainfall activity within the conterminous U.S. during the SIR-B mission. Swaths of the actual SIR-B data taken were plotted onto the GOES satellite scenes most closely representing the time of the Shuttle overpass. The JPL provided EarthSat with available SIR-B imagery in paper print form representing the appropriate requested data takes. EarthSat identified the collateral data required for site characterization during subsequent SIR-B contracts with JPL. E.A.K.

N85-25987*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MESOSCALE ATMOSPHERIC PROCESSES RESEARCH PROGRAM SCIENCE REVIEW
Leland Dubach, ed. 1985 102 p refs Rev. held in Greenbelt, Md., 14-16 May 1985
(NASA-TM-87465; NAS 1.15:87465) Avail: NTIS HC A06/MF A01 CSCL 04B

Presentations addressing special observtions and analysis of mesoscale systems, numerical modeling of mesoscale phenomena, and the developement of observing systems are summarized. Cyclones and other severe storms, convective modeling, precipitation and the hydrologic cycle, and statellite sounding are discussed. For individual titles, see N85-25988 through N85-26019.

N85-25988*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HURRICANE STRUCTURE AND DYNAMICS FROM STEREOSCOPIC AND INFRARED SATELLITE OBSERVATIONS AND RADAR DATA
A. Hasler and R. Morris (GSC) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 2 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The objectives, significant accomplishments, and future plans of a project to determine the relation of tropical cyclone cloud characteristics and structure to storm rainfall and dynamics are summarized. The project emphasis is on special data sets where geosynchronous satellite observations (visible, infrared, and stereo) of clouds are available along with cloud track winds (with stereo height assignment) and ground-based or aircraft-based radar reflectivity data. Infrared and stereoscopic visible satellite data from GOES-East and West were combined with ground-based radar data from Hurricane Frederic (1979) and time-composited airborne radar from Hurricane Allen (1980) to investigate hurricane cloud and precipitation structure. Cloud winds with stereoscopic cloud top height assignments were measured within a ten degree latitude radius of Hurricane Frederic using 7.5 min interval GOES data and were combined with rawinsonde and low-level aircraft wind data. It was observed that stereoscopically measured cloud top heights in these hurricanes are not nearly as closely correlated to radar reflectivity at lower levels as they are in intense thunderstorms over land. M.G.

N85-25989*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MONITORING TROPICAL CYCLONE GROWTH USING GOES VISSR/VAS AND NIMBUS-7 TOMS DATA
E. Rodgers, J. Steranka (GSC), and J. Stout (GSC) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 5 p refs (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The objectives, accomplishments, and future research of a project to monitor and possibly predict tropical cyclone intensity change (maximum winds or minimum pressure), strength change (average wind speed at radii between 100 and 300 km), and outer circulation change (average wind speed beyond 400 km) using satellite data are discussed. Tropical cyclone growth changes are dependent upon the inertial stability of the storm's circulation. Since the storm's lower and middle troposphere is highly stable while the upper troposphere is weakly stable, strength and outer circulation changes are monitored by examining the lower- and middle-tropospheric forcing and intensity changes are monitored by examining the upper-tropospheric forcing. Multiple linear regression equations were derived to retrieve geopotential height, layer thickness, and precipitable water content from GOES vertical atmospheric sounder (VAS) every 3 h in clear regions surrounding tropical cyclones Beryl and Debbie. Advective and mass adjustment processes associated with changes in the upper-tropospheric circulation surrounding tropical cyclone Irene were examined using the GOES visible/infrared spin-scan radiometer (VISSR) and Nimbus-7 total ozone monitoring system (TOMS) data. M.G.

N85-25990*# Pennsylvania State Univ., University Park.
ANALYSIS OF THE INFLOW AND AIR-SEA INTERACTIONS IN HURRICANE FREDERIC
W. Frank *In* NASA. Goddard Space Flight Center Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 3 p ref (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Significant accomplishments and future plans of a project to study the properties of Hurrican Frederic are summarized. The specific objectives of the study are to: (1) determine the effective heights of the satellite wind vectors; (2) integrate satellite, aircraft, rawinsonde, and surface wind measurements into a three-dimensional analysis of the storm inflow layer over water; (3) construct similar analyses of the thermodynamic fields in the inflow layer; (4) perform diagnostic budget analyses of moisture, sensible heat, kinetic energy, and momentum in the inflow layer; and (5) examine air-sea interactions from residuals in the budget analyses. M.G.

N85-25991*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CONVECTION MODELING AND APPLICATION TO SEVERE STORMS
J. Simpson and M. McCumber *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 5 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Objectives and activities of a project to understand, diagnose, and predict the dynamics, precipitation, and severe weather activities of cumulus-type clouds and cloud systems are discussed. An aim is to provide a framework for relating space and remote observations to internal cloud processes, thereby to obtain more extensive and accurate information on convective precipitation systems from existing and future space data. A hypothesis concerning cumulus-scale parent vortices and their intensification to waterspout strength was developed using a combination of GATE observations and an improved high-resolution version of Schlesinger's model with a Kessler-type precipitation scheme. Model results show that cumulus outflows, particularly two or more outflows approaching intersection, can alter the cumulus environment to create (rarely) the special combination of thermal, moisture, and wind stratifications in low levels required for strong, vertically coherent cumulus-scale vortices to develop to the vorticity magnitudes of mid-latitude mesocyclones. The convective invigoration and convergence associated with the intersecting outflows was also shown to be adequte to intensify the cumulus vortex to funnel intensity in the 5 to 10 minute time window allowed by updraft lifetime. M.G.

N85-25992*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MODELING OF CLOUD SYSTEMS
W. Tao (GSC) and J. Simpson *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 2 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Accomplishments and activities of a program to study the development of organized convective systems with varying large-scale influence by means of a fully three-dimensional multi-cloud model are summarized. A three-dimensional numerical multi-cloud model was vectorized for the NASA CYBER 205 vector processor. The model was applied to the deep convection observed over the GATE A/B-scale ship array on August 12, 1984. Two cases involving mergers were studied through examining the temperature, moisture, pressure, and wind fields prior to, during, and following the merging model clouds. The first case involves two older clouds and a younger one. The younger cloud develops vigorously as its nearby low-level convergence is enhanced. This substantial increase of low-level convergence is the consequence of the approach of two older clouds' cold outflows. Another case involved only two clouds with differential propagation speeds. The relatively fast-moving one catches and merges with the second one. Based on model results, it was found that the fast propagation of a cloud is simply the result of discrete generation of new convection along the cold outflow. M.G.

N85-25993*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANVIL STRUCTURE OF SEVERE THUNDERSTORMS
G. Heymsfield, S. Schotz (GSC), and R. Blackmer (GSC) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 2 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Objectives and accomplishments of a project to document and quantify severe thunderstorm cloud top and anvil structure using satellite, Doppler radar, and supporting data are summarized. Project emphasis is placed on relating the satellite-observed thunderstorm observations to the environmental wind and internal storm structure. Specific data sets being analyzed are: (1) SESAME and non-SESAME cases during the period 1979 to 1981; (2) a severe (non-tornadic) thunderstorm on 1 August 1981 during CCOPE; and (3) May 1984 ER-2 aircraft experiment data. A simple kinematic particle trajectory model is used to gain insight on the 'V' pattern observed in the IR observation. M.G.

N85-25994*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LIDAR AND RADIOMETER OBSERVATIONS OF THUNDERSTORM TOPS
J. Spinhirne and W. D. Hart (SSAI) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 2 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Techniques were developed to observe high clouds with advanced instrumentation and analysis concepts. The goal is to lead to an improved understanding of the observed characteristic of thunderstorms and other clouds and to also lead to the definition of improved spaceborne sensors for storm and cloud observations. The cloud lidar system (CLS) and multispectral cloud radiometer (MCR) were developed as advanced airborne instruments for cloud remote sensing. They were operated in the past several years from high altitude aircraft. The CLS provides absolute ranges to cloud tops and also density structure and particle phase inference within cloud tops. The MCR provides high resolution observations of visible, near IR, and thermal radiation and includes specific channels for passive cloud top height and particle size and phase

determination. Individual case studies for the CLS and MCR were examined in detail. These include observation of multiple cloud layers, cirrus, and marine stratus. A combined analysis of the active lidar data coupled to passive radiance data was also conducted. M.G.

N85-25995*# Wisconsin Univ., Madison.
MODELING OF MIDWEST SEVERE THUNDERSTORMS
R. Schlesinger *In* NASA. Goddard Space Flight Center Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 4 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

A three dimensional anelastic numerical cloud model was used to address two main areas relevant to infrared and visible geostationary satellite observations of severe convective storms: (1) the dynamics of close in cold/warm cloud top thermal couplets such as were observed atop some severe storms with strong internal rotation; and (2) whether significant differences exist in cloud top height/temperature structure between storms with and without strong internal rotation. The main feature of this modeling project was the diagnosis of cloud top features as well as the cloud interior, in order to look for possible correlations between patterns at cloud top and further down where radar or in situ sensors can provide other storm scale data. B.G.

N85-25996*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITE DETECTION OF SEVERE THUNDERSTORMS
R. Adler, R. Mack (GSC), and M. Markus (GSC) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 4 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The objectives are to (1) increase our understanding of convective cloud top structure and evolution; and (2) use this information to develop and test techniques to detect severe thunderstorms with satellite data. Author

N85-25997*# Wisconsin Univ., Madison.
SEVERE STORM DETECTION WITH PASSIVE 37 GHz OBSERVATIONS
R. Spencer, M. Howland, and D. Martin *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 2 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The severe storm detection potential of satellite observed passive 37 GHz radiances was evaluated by comparing Nimbus-7 Scanning Multichannel Microwave RAdiometer (SMMR) data to reports of severe weather contained in the NSSFC severe weather log for calendar years 1979 and 1980 over the United States east of the Rocky Mountains. Heavy thunderstorms have a characteristic signature in the form of localized, very low 37 GHz T sub B from scattering by precipitation size ice particles (thick cirrus being transparent at this frequency). The information content of satellite passive 37 GHz brightness temperatures on the severity of thunderstorms, through the measurement of the attenuation (scattering) signature of precipitation was determined. Author

N85-25998*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOIL MOISTURE AND EVAPOTRANSPIRATION ESTIMATES BASED ON SATELLITE DATA c43
P. Wetzel, R. Woodward (GSC), and J. Chang *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 4 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 08M

An accurate, verifiable land surface/vegetation/evapotranspiration model for remote sensing applications was developed as a parameterization for use in the Kaplan MASS model for two purposes: (1) to simulate the response of the boundary layer to variations in surface characteristics, such as soil moisture and land use; and (2) to apply these models to the estimation of surface soil moisture and evapotranspiration and to study the effects of the surface on convective storm initiation. Author

N85-25999*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ESTIMATION OF CONVECTIVE RAINFALL FROM VISIBLE AND INFRARED SATELLITE DATA
A. Negri and R. Adler *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 4 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Using the 11.6 micron infrared (IR) and 0.5 micron visible (VIS) data from a geostationary satellite, the rate, area, and duration of convective rainfall on scales of 100 to 300 sq km and 15 to 30 min. were estimated. The technique was developed from basic physical principles, cloud modeling results, and statistics based on radar/satellite analysis. The sensitivity of these estimates were determined to variations/deletions in the parameters, and the results tested against other schemes and against ground truth. Author

N85-26000*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH-FREQUENCY MICROWAVE OBSERVATIONS OF CONVECTIVE PRECIPITATION
R. Adler, I. Hakkarinen (GSC), R. Mack (GSC), J. Firestone (GSC), and F. Szejwach (USRA) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 3 p refs (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The advanced microwave moisture sounder (AMMS) is a four-channel passive scanning radiometer. Three channels of the AMMS are centered on the 183 GHz water vapor absorption line and the fourth channel is located at 92 GHz in an atmospheric window. The radiometer scans + or - 45 deg. across the track of the aircraft and has a ground resolution from 18 km altitude of 350 m (700m) in the 183 (92) GHz channels. Images and data from the AMMS instrument were analyzed in coordination with observations at visible and 11 micron wavelengths from the multichannel cloud radiometer (MCR) the cloud lidar system (CLS), and ground-based radar, their high-frequency mirowave observations are investigated to deduce their potential and limitations for observing convective and stratiform precipitation. B.G

N85-26001*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MESOSCALE ANALYSIS AND MODELING GROUP
L. Uccellini *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 3 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The specific objectives of the Mesoscale Analysis and Modeling Group are: (1) detailed studies of the SESAME-, VAS-, and CCOPE-related cases and other cases as well emphasizing the role of gravity waves, jet streaks, and frontogenesis in severe local and winter storms; (2) studies emphasizing the interactions between larger-scale dynamics-boundary layer, atmosphere-ocean and stratosphere-troposphere during severe weather events; (3) numerical simulations of specific cases to better understand the scale interaction associated with fronts and jets, the synergistic relationship between large-scale dynamics and physical processes in the pre-storm environment, and the sensitivity of the forecasts to initial state perturbations; (4) the assessment of total ozone analysis from TOMS and water vapor imagery for the study of jet streak circulations, tropopause folds, and associated severe weather events; and (5) an evaluation of mesoscale models over a large number of cases to determine the utility of the models for satellite impact. Author

N85-26002*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REVIEW OF VAS DEMONSTRATION
L. Uccellini, H. Montgomery, D. Chesters, and R. Petersen *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985

3 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The visible infrared spin scan radiometric atmospheric sounder (VAS) and its operating modes are described, radiometric specifications, promising meteorological results, and data sets are presented. The VAS image data was used to diagnose the vertical, horizontal, and temporal evolution of tropospheric water vapor. A sounding algorithm was developed which combines VAS radiances with surface temperature and dewpoints. The VAS temperature and dewpoint retrievals show that they contain quantiative information about the potential for instability in a pre-convection environment which cannot be otherise discovered from the operation surface and radiosonde reports. B.G.

N85-26003*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NOWCASTING APPLICATIONS OF VAS
R. Petersen and J. Homan (GSC) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 2 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

A simple, isentropic forecast procedure was developed which maintains the resolution of its detailed initial analysis throughout a 12-h cycle. The technique is computationally efficient and was adapted tc the VAX computing system. Forecasts were obtained of upper-level trajectories emanating from a jet streak in a case of strong baroclinicity and curved flow. The trajectories, while experiencing substantial energy changes, agreed well with trajectories obtained from the observed radiosonde data. These results may have implications for upper-level aviation wind forecasts. Three-dimensional forecasts were obtained of 29 August 1984 severe storm development. Properly isolated location and movement of regions of greatest tropopause heights, maximum mid-level P.V.A., and low-level moisture transport 9 to 12 h prior to storm development. Three- to twelve-h forecasts of simulated VAS 6.7 micron and split window imagery for the 13 July and 20 July 1981 cases were produced. The forecast images captured the progression of low-level moisture maxima and mid-level dryness bands observed in the initial mage data using horizontal advection and adiabatic warming. B.G.

N85-26004*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECENT VAS IMAGING/SOUNDING RESEARCH
D. Chesters, L. Uccellini, R. Petersen, D. Keyse (GSC), A. Mostek (GSC), W. Robinson (GSC), and D. Larko (RDS) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 3 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

An objective statistical evaluation of the accuracy of Vertical Atmospheric Sounder (VAS) retrievals was conducted for VAS/AVE satellite/radiosonde special network experiment of 1982. Qualitative analysis techniques were developed for VAS image data which display the space-time behavior of convective stability fields at mesoscale resolution in near real-time. A physically based retrieval algorithm for calculating stability parameters from VAS radiances was implemented and tested. B.W.

N85-26005*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SIMULATION EXPERIMENT ON THE IMPACT OF GEOSTATIONARY TEMPERATURE RETRIEVALS IN NUMERICAL MODELS
T. Gal-Chen (Oklahoma Univ.), B. Schmidt (GSC), and L. Uccellini *In its* Mesoscale Atmospheric Processes Res. Program Sci. Res. 1985 2 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

A variational assimilation technique was developed that has the unique characteristic that only the vertically averaged temperature is inserted from Vertical Atmospheric Sounder (VAS), while the model retains its own higher-frequency modes. The technique allows for time-continuous assimilation. In this way, the approach takes advantage of a strength of VAS (increased temporal resolution) while avoiding a major weakness (poor vertical resolution). A simulation experiment was completed using a baroclinically unstable wave (specified analytically) as a control. The experiment shows that the insertion of mean temperatures, comparable to those observed by Vas, has greater impact if multiple insertions are used rather than just inserting the VAS data at one time. B.W.

N85-26006*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VAS/MODEL IMPACT STUDY
R. Aune (SASC), M. Kaplan (SASC), J. Cram (SASC), and L. Uccellini *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 2 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Impact studies have been conducted for (Vertical Atmospheric Sounder) VAS data using a four-dimensional assimilation scheme based on a variational approach (without vertical coupling). The largest impact on the simulation of developing convective instability was found when successive insertions of VAS data over a 6-h period better resolved the mesoscale structure of the temperature and moisture fields. A technique was developed for assimilating VAS thickness data based on a technique developed by Gal-Chen that preserves small-scale features in the temperature field, while replacing the large-scale features with VAS observations. A three-dimensional variational-type approach was used to minimize imbalances generated by the VAS observations. A Newtonian nudging technique was used between assimilation times to effectively increase the frequency of the assimilated VAS data. B.W.

N85-26007*# Pennsylvania State Univ., University Park.
UTILIZATION OF SATELLITE DATA IN MESOSCALE MODELING OF SEVERE WEATHER
T. Warner *In* NASA. Goddard Space Flight Center Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 3 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The purpose of this study is to determine how VAS-derived temperature and moisture data can be most effectively utilized in mesoscale numerical models. The effect of the VAS data on the structure of temperature and moisture analyses that also employ radiosonde data was examined. Techniques that are based on various methods of combining VAS and radiosonde data for a static initialization of the mesoscale model were investigated. A dynamic initialization procedure was utilized to initialize the forecasts. The impact of the use of the VAS data on the noise characteristics of the model solution was assessed. B.W.

N85-26008*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ROLE OF JET STREAKS AND BOUNDARY LAYER PROCESSES IN ORGANIZING A PRE-CONVECTIVE ENVIRONMENT
K. Brill (GSC), J. Zack (SASC), L. Uccellini, and P. Kocin (Pennsylvania State Univ.) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 2 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Jet streak-induced circulations that influence the pre-convective environment are investigated. A case study approach based on radiosonde data and mesoscale numerical simulations is discussed. The research also includes determining the means and extent to which boundary layer processes enhance the jet-induced circulations and influence convective development. B.W.

N85-26009*# Systems and Applied Sciences Corp., Riverdale, Md.
IMPACT OF SOIL MOISTURE IN ORGANIZING A SEVERE STORM OUTBREAK
G. Coats, J. Zack, and M. Kaplan *In* NASA. Goddard Space Flight Center Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 2 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The objective of this research is to evaluate the importance

of incorporating soil moisture in a mesoscale atmospheric simulation system when forecasting the severe convective storm environment. MASS Simulations of the pre-convective environment were found to be sensitive to the initial soil moisture specification. Simulations with soil moisture based on an observed Anecedent Precipitation Index (API) were found to be superior to those based on a uniform distribution of soil moisture. Simulations with soil moisture based on a climatological API, however, were found to be slightly better than those based on the observed API. This may indicate the need for incorporating the effects of varying vegetation types or densities. Nested-grid simulations produced a stronger local inland sea breeze circulation near observed soil moisture gradients which produced an environment more favorable for convective development. Author

N85-26010*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ROLE OF FRONTAL CIRCULATIONS AND GRAVITY WAVES IN INITIATING CONVECTIVE STORM SYSTEMS
S. Koch, W. Skillman, R. Golus (GSC), and J. McQueen (SASC) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 3 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Surface and upper air were data used to infer likely existence of a frontogenetical circulation capable of producing vertical motions strong enough to generate the mesoscale clear zone and frontal line convection, and ultimately the squall line. The role of internal gravity waves in organizing precipitation and cloud fields in a July 1981 (Cooperative Convective Precipitation Experiment) CCOPE case was determined. The vertical structure of internal gravity waves was studied using stereoscopic GOES data, radar cross sections and surface mesonetwork time series. The feasibility of using upper-level cloud motions as tracers of the wave-induced divergence fields to help in analysis of wave's vertical structure was examined. B.W.

N85-26011*# Systems and Applied Sciences Corp., Riverdale, Md.
MESO-S SCALE NUMERICAL SIMULATIONS OF THE JET STREAK ADJUSTMENTS WHICH ORGANIZED THE CAROLINA TORNADO OUTBREAK AND THE SUBSEQUENT EXPLOSIVE COASTAL CYCLOGENESIS
M. Kaplan, J. Zack, and V. Wong *In* NASA. Goddard Space Flight Center Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 3 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The development of a comprehensive cloud and mesoscale numerical modeling system is discussed. Adiabatic and diabatic processes are investigated which are responsible for the organization of mesoscale circulation systems that influence East Coast and other convective storms. B.W.

N85-26012*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SEA BREEZE-INDUCED MESOSCALE SYSTEMS AND SEVERE WEATHER
R. Pielke (CSU) *In its* Mesoscale Atmospheic Processes Res. Program Sci. Rev. 1985 3 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Thunderstorm activity over south Florida was characterized climatologically. The physical processes associated with the occurrence and patterning of satellite-observed deep convection over south Florida are described. A mesoscale model of the sea breezes is utilized over the study area to investigate and explain the physical processes associated with sea breezes such as found over south Florida. E.A.K.

N85-26013*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EAST COAST SNOWSTORM SURVEY
P. Kocin and L. Uccellini *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 3 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The temporal and spatial characteristics of a large sample of major winter snowstorms that paralyzed the heavily urbanized centers of the Northeast are described by utilizing snowfall, surface and upper-air rawinsonde observations, model simulations, and satellite imagery. The current literature on East Coast storms is surveyed. An atlas of cases is of use to the research community (especially with regard to upcoming GALE and STORM projects) and to operational and university needs (especially geared to forecasters and students) is constructed. E.A.K.

N85-26014*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NUMERICAL STUDIES OF FRONTAL DYNAMICS
M. Pecnick (GSC) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 5 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Frontogenetical mechanisms of confluence (stretching deformation) and horizontal shear (shearing deformation) were incorporated into a mathematically consistent two-dimensional formulation suitable for a cross-section primitive equation (PE) model. Accounting for the structural differences between surface cold and warm fronts and the development of a realistic tropopause fold during upper-level frontogenesis are addressed. The geostrophic adjustment characteristics of a statically stable rotating, compressible atmosphere to initial imbalance in frontal systems was determined. The outcome of this particular effort should serve as a basis for interpreting the results of initialization procedures developed for mesoscale PE models with sufficient resolution to resolve frontal-scale processes. Ageostrophic circulations in the PE frontal model is diagnosed. The applicability of filtered diagnostic approaches based upon the quasi and semigeostrophic theories, and a formulation based on the unfiltered primitive equations, will be tested using the model as a data source. The three diagnostic approaches are valuable for interpretion of the results of the frontal simulations obtained in support of the first objective, and the unfiltered version is useful in the analysis of the details of the geostrophic adjustment process in the PE model initialization experiments planned under the second objective. E.A.K.

N85-26015*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SENSITIVITY OF MESOSCALE CYCLOGENESIS FORECASTS TO DETAILED THREE-DIMENSIONAL ISENTROPIC INITIAL ANALYSES AND VARIED VERTICAL MODEL RESOLUTION
R. Petersen, L. Uccellini, and K. Brill (GSC) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 2 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Simulation of the development of mesoscale frontal features influencing rapid cyclogenesis was undertaken. The use of results from regional, high-resolution isentropic objective analyses as initial conditions for a mesoscale numerical model were examined. The application of the improved model simulations to diagnose more thoroughly the evolution of the scale-interactive dynamic and thermodynamic process responsible for the development of severe convective and winter storms is investigated. E.A.K.

N85-26016*# Systems and Applied Sciences Corp., Riverdale, Md.
MODEL SENSITIVITY STUDIES OF MAJOR EAST COAST STORMS
J. Zack, M. Kaplan, V. Wong, and G. Coats *In* NASA. Goddard Space Flight Center Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 2 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The improvement of the simulation of East Coast cyclones and their associated precipitation patterns was undertaken. Specific objectives include: (1) identification of the important physical

processes which determine the evolution and morphology of the East Coast cyclone and its distribution of precipitation; (2) assessment of the sensitivity of the mesoscale numerical model to the manner in which these physical processes are parameterized; (3) identification of the critical areas in which the model physics must be further developed in order to significantly improve the simulations; and (4) estimation of the limits placed upon the simulations by the current availability of data and the implications of further remotely sensed data sets. E.A.K.

N85-26017*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
JUSTIFICATION AND PLAN FOR PARTICIPATION IN GALE
L. Uccellini, P. Kocin, and M. Kaplan (SASC) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 3 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The overall objective is the continuation of research into the study of East Coast storms using conventional and satellite data and numerical simulations archived during the Genesis of Atlantic Lows Experiment (GALE). Specific objectives include: (1) the study of scale interactions and the interaction between dynamic and diabatic processes that influence the storms using actual data in concert with detailed mesoscale model experiments; (2) the assessment of TOMS ozone data for the study of stratospheric-tropospheric exchange prior to and during cyclogenesis. E.A.K.

N85-26018*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THREE-DIMENSIONAL/PERSPECTIVE DISPLAY TECHNIQUES FOR METEOROLOGICAL DATA SETS
A. Hasler and H. Pierce (GSC) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 2 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The development of a three-dimensional perspective presentation techniques which allow the display of the massive, complex data sets typical of meteorology in a manner which makes it easier to detect and understand significant features. Perspective display techniques were applied to meteorological data sets interpretation. The display procedure was applied to satellite and aircraft visible and infrared image pairs and to stereo cloud height analyses. The procedure uses a sophisticated shading algorithm that produces perspective images with greatly improved comprehensibility when compared with the wire-frame perspective displays that have been used in the past. By changing the eye-point and view-point inputs to the program in a systematic way, move loops are made which give the impression of flying over or through the data field. Several examples are completed which show how different kinds of meteorological data fields are more effectively illustrated by using the perspective technique. E.A.K.

N85-26019*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GENERAL METEOROLOGICAL PACKAGE (GEMPAK)
M. desJardins, R. Petersen, M. Vilardo (RDS), I. Graffman (RDS), and M. Goodman (RDS) *In its* Mesoscale Atmospheric Processes Res. Program Sci. Rev. 1985 2 p (For primary document see N85-25987 15-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The development of an interactive meteorological processing system which can process the many types of data (satellite sounding, radiosondes, surface, model output) used by the Severe Storms Branch is discussed. A graphics system (GEMPLT) is an integral part of GEMPAK. A secondary objective is to deliver GEMPAK/GEMPLT to universities which have access to vAX hardware and to continue an exchange of software to continually upgrade systems at the universities and at GSFC. E.A.K.

N85-26020# National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Satellite, Data and Information Service.
NOAA SATELLITE OPERATIONS: PROGRAMS BRIEFING
Mar. 1985 269 p
Avail: NTIS HC A12/MF A01

The National Environmental Satellite, Data, and Information Service manages U.S. civil operational Earth-observing satellite systems as well as global data bases for meteorology, oceanography, solid-Earth geophysics, and solar-terrestrial sciences. The satellites including their sensors, data, and products and their communication and relay functions are described. Domestic and international distribution of the data, and interactions with international weather satellites are examined. The NOAA concept of a polar platform for the space station complex is presented as well as a review of satellites from 1960 to 1985. A.R.H.

N85-26021# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
CHARACTERISTICS OF PRECIPITATION REGIMES DURING FIRST GLOBAL ATMOSPHERIC RESEARCH PROJECT GLOBAL EXPERIMENTS M.S. Thesis
G. D. Ahrens Dec. 1984 87 p
(AD-A151572; AD-E500700; AFIT/CI/NR-85-6T) Avail: NTIS HC A05/MF A01 CSCL 04/2

For this thesis precipitation data are obtained from the GWE (Global Weather Experiment) FGGE (First GARP (Global Atmospheric Research Project) Global Experiment) data sets observed from December 1978 through November 1979. The FGGE precipitation data are compared to climatological data and other fields compiled or calculated from the FGGE data. These other fields are the U and V wind components, heating fields, velocity potentials, and stream functions. The precipitation data are edited and put into a useful global format. The 1979 data are compared to climatology. The precipitation fields generally agree with more extensive climatologies, though some important regional differences are noted. Large scale overturning circulations are colocated with extensive areas of precipitation in the tropics. The analysis of rainfall is adversely affected by the sparse data density over the oceans and in remote areas. In the future, the precipitation data should be combined with and scrutinized against satellite data, especially over the oceans. GRA

N85-26022# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DEVELOPMENT AND VALIDATION OF A NEW FALLOUT TRANSPORT METHOD USING VARIABLE SPECTRAL WINDS Ph.D. Thesis
A. T. Hopkins Sep. 1984 172 p
(AD-A151871; AFIT/DS/ENP/84-2) Avail: NTIS HC A08/MF A01 CSCL 04/2

The purpose of this research was to develop and validate a fallout prediction method using variable transport calculations. The new method uses National Meteorological Center (NMC) spectral coefficients to compute wind vectors along the space and time varying trajectories of falling particles. The method was validated by comparing computed and actual cloud trajectories from a Mount St. Helens volcanic eruption and a high dust cloud. In summary, this research demonstrated the feasibility of using spectral coefficients for fallout transport calculations, developed a two-step smearing model to treat variable winds, and showed that uncertainties in spectral winds do not contribute significantly to the error in computed dose rate. GRA

N85-26023# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
RADAR TURBULENCE ESTIMATES. EFFECTS OF WIND SHEAR AND REFLECTIVITY FACTOR GRADIENTS M.S. Thesis
S. J. Sycuro Feb. 1985 72 p
(AD-A151876; AFIT/CI/NR-85-31T) Avail: NTIS HC A04/MF A01 CSCL 04/2

Analysis of Doppler radar spectral width provides an estimate of the turbulence eddy dissipation rate (epsilon), which in turn can be correlated to atmospheric turbulence. The width of the Doppler spectrum provides an overestimate of the turbulence eddy dissipation rate. This overestimate may be corrected to some extent by the removal of wind shear and reflectivity factor gradients from the Doppler spectrum variance. Reflectivity factor gradients and

radial velocity shears in three directions (azimuthal, vertical, and radial) are computed for points along an aircraft track. The gradient and shear effects are removed from the Doppler variance and the turbulence eddy dissipation rate is estimated using both the total and the corrected variances. Both radar estimates of the turbulence dissipation rates are then correlated with estimates of eddy dissipation rates derived from in-situ aircraft measurements. Results indicate that the only gradients significantly affecting the radar estimates are those of radial velocity shear components along the vertical or azimuthal directions. Corrections for these effects result in some improvements in the radar turbulence estimate, but the improvements are very small at the short ranges observed here. Results suggest that the gradient effects may be minor when compared to the other sources of error in the estimate of turbulence dissipation rates. GRA

N85-26024# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
GLOBAL PALEOCLIMATIC DATA BASE FOR 6000 YEARS BP
T. Webb, III Feb. 1985 159 p refs
(Contract DE-AC02-79EV-10097)
(DE85-006628; DOE/EV-10097/6) Avail: NTIS HC A08/MF A01

Pollen, lake level, and marine plankton data form a global data base with 797 stations for 6000 yr BP. Sets of pollen samples are available from eastern North America, Alaska, Europe, the Soviet Union, South America, and New Zealand. Sites with lake level data provide coverage in Australia, Africa, southweestern Asia, and western North America, as well as in eastern North America and South America. Marine plankton data are mainly available from the North Atlantic and northwestern Indian Oceans, but isolated samples exist in the Pacific and Southern Oceans. Estimated temperature values are available from eastern North America, Europe, and the ocean samples, and estimated precipitation values exist for central North America and for isolated sites in India and Africa. DOE

N85-26025# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
ILUM CODE: SOLAR AND LUNAR FLUX CALCULATIONS FOR MULTI-CLOUD LAYERED ATMOSPHERES
L. D. Duncan (Atmospheric Sciences Lab.), R. C. Shirkey (Atmospheric Sciences Lab.), and A. Zardecki 1984 5 p refs Presented at the EOSAEL-TWI Conf., Las Cruces, N. Mex., 27-29 Nov. 1984
(Contract W-7405-eng-36)
(DE85-005578; IA-UR-84-3969; CONF-8411143-1) Avail: NTIS HC A02/MF A01

The computer code ILUM computes solar/lunar illumination received at the ground as a function of geographical location, date, standard time, and meteorological conditions. Both the computational method and program logic are described. DOE

N85-26026# National Center for Atmospheric Research, Boulder, Colo. Atmospheric Analysis and Prediction Div.
ANNUAL CYCLE. PART 1: THE ANNUAL VARIATION OF SURFACE TEMPERATURES OVER THE UNITED STATES AND CANADA
Dennis J. Shea Oct. 1984 84 p refs Sponsored by NSF 2 Vol.
(PB85-147676; NCAR/TN-242-Pt-1) Avail: NTIS HC A05/MF A01 CSCL 04B

Daily maximum and minimum surface temperatures for 354 seconds-order U.S. and Canadian stations generally spanning 40-80 years are used to calculate the following quantities for each station: (1) daily mean maximum, minimum, and average temperatures for each day of the year; (2) monthly, seasonal, and annual means; (3) the amplitudes and phases of the mean annual cycle; (4) the interannual variability of each of the aforementioned quantities; and (5) mean spectra for the four seasons. Several examples from individual stations are chosen to illustrate various regional and local peculiarities. GRA

N85-26027# National Center for Atmospheric Research, Boulder, Colo. Atmosphereic Analysis and Prediction Div.
ANNUAL CYCLE. PART 2: THE ANNUAL VARIATION OF PRECIPITATION OVER THE UNITED STATES AND CANADA
Dennis J. Shea Oct. 1984 74 p refs Sponsored by NSF 2 Vol.
(PB85-147684; NCAR/TN-243-Pt-2) Avail: NTIS HC A04/MF A01 CSCL 04B

Daily precipitation data for 370 second-order U.S. and Canadian stations generally spanning 40 to 80 years are used to calculate the following quantities for each station: (1) mean daily, weekly, monthly, seasonal, and annual precipitation; (2) the interannual variability of the aforementioned quantities; and (3) the unconditional probability of precipitation on a particular day or week of the year. Several examples from individual stations are chosen to illustrate various regional and local peculiarities. Spatial characteristics of precipitation are briefly described. GRA

N85-25338# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF SYSTEM FOR OBSERVING NORTHERN HEMISPHERE ATMOSPHERIC PRESSURE FIELD Abstract Only
A. I. Belyavskiy and O. M. Pokrovskiy *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 105 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (USSR), no. 3, May-Jun. 1984 p 3-13 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25918# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
THE TEMPERATURE FLUCTUATION IN STABLE STRATIFICATION ABOVE SNOW COVER
Nobuyoshi Ishikawa, Hideaki Motoyama, and Kenji Kojima *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 69-78 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

N85-25919# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
AN EQUATION OF PROFILE OF SNOW DRIFT DENSITY DURING SNOWFALL
Shunichi Kobayashi *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 79-83 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

N85-25920# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
MEASURING METHODS OF ATMOSPHERIC ELECTRIC ELEMENTS AT THE EARTH'S SURFACE DURING SNOWFALL AND INVESTIGATION OF THESE RELATIONSHIPS
Tatsuo Endoh and Takashi Taniguchi *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 85-100 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

N85-25921# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
CASE STUDIES OF SNOW CLOUDS BY MEANS OF SNOW CRYSTAL SONDES
Sinri Irikawa, Tatsuo Endoh, Tomomi Yamada, and Gorow Wakahama *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 101-112 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

N85-25922# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
OBSERVATION OF PRECIPITATING CLOUDS BY A VERTICALLY POINTING RADAR AT MORINO IN THE IBURI DISTRICT, HOKKAIDO, JAPAN
Yasushi Fujiyoshi, Tatsuo Endoh, and Tomomi Yamada *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 113-123 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

N85-26044*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
POTENTIAL CLIMATIC EFFECTS ON THE GREENLAND ICE SHEET
Robert A. Bindschadler *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 50 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 04B

N85-26045*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
CLIMATIC IMPACT OF A CHANGE IN NORTH ATLANTIC DEEP WATER FORMATION
David Rind *In its* North Atlantic Deep Water Formation Dec. 1984 p 51-54 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 04B

N85-26188# Natal Univ., Pietermaritzburg (South Africa). Dept. of Agricultural Engineering.
COMPUTERS IN THE DETERMINATION OF RAINFALL SEPTH-DURATION-FREQUENCIES IN NATAL
R. E. Schulze *In* South African Inst. of Civil Engineering Symp. on Computers in Civil Eng., 1983 1983 48 p refs (For primary document see N85-26182 15-61)
Avail: NTIS HC A10/MF A01

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N85-26028*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
NORTH ATLANTIC DEEP WATER FORMATION
Theodore Bennett, ed., Wallace Broecker, ed., and James Hansen, ed. Dec. 1984 74 p refs Symp. held in Palisades, N.Y., Feb. 1985 Sponsored by NASA. Goddard Space Flight Center (NASA-CP-2367; NAS 1.55:2367) Avail: NTIS HC A04/MF A01 CSCL 08J

Various studies concerning differing aspects of the North Atlantic are presented. The three major topics under which the works are classified include: (1) oceanography; (2) paleoclimate; and (3) ocean, ice and climate modeling. For individual titles, see N85-26029 through N85-26046.

N85-26029*# Scripps Institution of Oceanography, La Jolla, Calif.
REVIEW OF NORTH ATLANTIC SOURCE WATERS
James H. Swift *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 1-3 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08J

North Atlantic Deep Water (NADW) ventilates the deep World Ocean. It not only carries relatively well-oxygenated waters, but also other substances derived from recent sea-surface exchanges. There are five regional sources for NADW: (1) derivatives of the salty Mediterranean Sea outflow, (2) products of open-ocean convection in the Labrador Sea, (3) Iceland-Scotland Overflow Water from the Norwegian Sea - salty by virtue of mixing with saline water near the sills, (4) Denmark Strait Overflow Water from the Iceland and Greenland Seas - which retains a high-density, relatively low-salinity signal, and (5) remnants of deep water from the Antarctic circumpolar region - freshest of the bottom waters. Despite the differences of characteristics of the source waters, the NADW is relatively uniform. Because the formation of each of the five source waters may be viewed as a response to a complex series of events, it is difficult to examine the sensitivity of NADW to environmental fluctuations. It is known that the deep northern North Atlantic is relatively closely coupled to the sea surface in the Greenland and Iceland seas. The most recent studies indicate a minimum response time of only two years between the introduction of a passive signal north of Iceland and its appearance in the deep northwest Atlantic. G.L.C.

N85-26030*# Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.
DEEP WATER FORMATION
Peter D. Killworth *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 4-6 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08J

Some simple arguments on plumes of dense water and filling boxes were given. What determines the time for a large-scale environment to be modified by the injection of dense water at its edge is the mass flux, not the buoyancy flux. However, it is the denser buoyancy flux, when there are several competing plumes (e.g., the Mediterranean outflow versus the Denmark Strait outflow) that determines which plume will provide the bottom water for that ocean basin. It was noted that the obvious laboratory experiment (rotate a pie-shaped annulus, and heat/cool it on the surface) had never been performed. Thus, to some extent our belief that deep convection is somehow automatic at high latitudes to close off some ill-defined meridional circulation has never been tested. A summary of deep convection was given. The two fundamental formation mechanisms were shown. Of the two, it is open-ocean convection which forms the water which supplies the Denmark Strait overflow -- in all likelihood, as formation in the Greenland Sea remains stubbornly unobserved. But it is the slope convection which finally creates North Atlantic deep water, following the Denmark Strait overspill. G.L.C.

N85-26031*# Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
TEMPORAL AND SPATIAL SCALES OF LABRADOR SEA WATER FORMATION
R. Allyn Clarke *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 7-11 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08J

Labrador Sea Water is an intermediate water found at the same density and depth range in the North Atlantic as the Mediterranean water. It is formed by convection from the sea surface to depths greather than 2 km in winter in the Western Labrador Sea. The processes leading to deep convection begin with the formation of a 200 km scale cyclonic circulation about denser than average upper layer water in the Western Labrador Sea. This circulation pattern is hypothesized to be driven by an ocean/atmosphere heat exchange that has its maximum in this region. By early March, if deep convection is taking place, one sees that this body of denser upper waters penetrates to the top of the deep temperature/salinity maximum marking the core of the North Atlantic Deep Water. We note that the horizontal scale of this body is still 100-200 km normal to the coastline. G.L.C.

N85-26032*# Lamont-Doherty Geological Observatory, Palisades, N. Y.
CHEMICAL SIGNATURES ASSOCIATED WITH THE FRESHENING OF NORTHERN ATLANTIC WATERS BETWEEN 1972 AND 1981
Wallace S. Broecker *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 12-15 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08J

Further insight into the possible causes of the freshening of deep water in the northern Atlantic between the GEOSECS survey (1972) and the TTO survey (1981) is provided by measurements of dissolved silica and dissolved oxygen. As all the northern end member waters are low in dissolved silica content and high in dissolved oxygen content, the message carried by these chemical properties of silica has to do with the extent to which the waters in the northern Atlantic have mixed with the high silica content waters of Antarctic origin. A change in the degree and pattern of this intrusion is noted between the GEOSECS and TTO surveys. G.L.C.

N85-26033*# Lamont-Doherty Geological Observatory, Palisades, N. Y.
NORTH ATLANTIC DEEP WATER AND THE WORLD OCEAN
Arnold L. Gordon *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 16-18 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08J

North Atlantic Deep Water (NADW) by being warmer and more saline than the average abyssal water parcel introduces heat and salt into the abyssal ocean. The source of these properties is upper layer or thermocline water considered to occupy the ocean less dense than sigma-theta of 27.6. That NADW convects even though it's warmer than the abyssal ocean is obviously due to the high salinity. In this way, NADW formation may be viewed as saline convection. The counter force removing heat and salinity (or introducing fresh water) is usually considered to to take place in the Southern Ocean where upwelling deep water is converted to cold fresher Antarctic water masses. The Southern ocean convective process is driven by low temperatures and hence may be considered as thermal convection. A significant fresh water source may also occur in the North Pacific where the northward flowing of abyssal water from the Southern circumpolar belt is saltier and denser than the southward flowing, return abyssal water. The source of the low salinity input may be vertical mixing of the low salinity surface water or the low salinity intermediate water.
G.L.C.

N85-26034*# Marine Research Inst., Reykjavik (Iceland).
OCEANOGRAPHIC VARIATIONS IN RECENT DECADES AND THEIR IMPACT ON THE FERTILITY OF THE ICELAND SEA
Unnsteinn Stefansson *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 19-22 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08J

Due to its location at or near the oceanic polar front, the Iceland Sea is an area particularly sensitive to climatic changes. In warm years a strong influx of Atlantic water from the Irminger Sea can be traced all along the North Iceland shelf area. This inflow is mainly determined by past meteorological conditions at the west and north coasts of Ireland. In periods when the ice belt along the east cost of Greenland is relatively narrow, the surface layers between Iceland and Jan Mayen consist of arctic water with practically no polar component. Conversely, in cold periods an appreciable proportion of cold, low-salinity polar water is found in this area, and large parts of the North Icelandic shelf area may be covered with drift ice. Sea surface temperatures north of Iceland, especially in spring, are closely correlated to the frequency and extension of drift ice.
G.L.C.

N85-26035*# Bern Univ. (Switzerland). Physics Inst.
NORTH ATLANTIC DEEP WATER FORMATION: INFORMATION FROM ICE CORES
Hans Oeschger *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 23-27 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08J

The main results of measurements of the CO2 concentration of air occluded in natural ice during periods of climatic change are presented, as well as other measured ice core parameters. Elements of an interpretation of the data in terms of mechanisms of changing environmental systems are briefly discussed. G.L.C.

N85-26036*# Lamont-Doherty Geological Observatory, Palisades, N. Y.
QUATERNARY NORTH ATLANTIC SURFACE PALEOCEANOGRAPHY IN REGIONS OF POTENTIAL DEEP-WATER FORMATION
William F. Ruddiman *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 28-29 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08J

At the time scale of the Quaternary climate cycles, the sites of formation of North Atlantic Deep Water are not known. The interglacial extreme is presumably exemplified by the modern regions; the Norwegian, Greenland and Labrador Seas. During the major glacial-age coolings in the North Atlantic, the sites may have shifted well to the south, perhaps as far as the limit of the polar front at 40 to 50 N. Still other sites may have been important during intermediate climatic conditions. Because of the close coupling of high-latitude surface waters to North Atlantic Deep Water in the modern ocean, the history of sea-surface temperature (SST) oscillations across the high-latitude North Atlantic is relevant to an understanding of deep-water formation on the longer time scales.
G.L.C.

N85-26037*# Lamont-Doherty Geological Observatory, Palisades, N. Y.
GLACIAL-TO-INTERGLACIAL CHANGES IN NADW FLUXES?
Alan C. Mix and Richard G. Fairbanks *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 30-31 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08J

Interglacial gradients in delta 13C between Atlantic and Pacific deep waters reflect differences between low-nutrient, 13C-enriched North Atlantic Deep Water (NADW) and high-nutrient, 13C-depleted Pacific Deep Water. Reduced Atlantic-Pacific delta 13C and cadmium gradients at the last glacial maximum have been used to suggest substantial replacement of NADW with nutrient-rich Antarctic Bottom Water (Boyle and Keigwin, 1982; Shackleton et al., 1983). We show that the Atlantic delta 13C signal is linked directly to North Atlantic polar-front migration, as reflected by planktonic foraminiferal faunas.
G.L.C.

N85-26038*# Bern Univ. (Switzerland). Physics Inst.
CHANGES IN THE HIGH-LATITUDE OCEAN AS POSSIBLE CAUSES OF ATMOSPHERE CO2 VARIATIONS
Ulrich Siegenthaler *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 32 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08J

Measurements on air enclosed in old polar ice have indicated that the atmospheric CO2 concentration was ca. 50 to 70 ppm lower in late glacial times than during the Holocene. Similar measurements performed on samples from a Greenland ice core, dating ca. 30,000 to 40,000 B.P., and have yielded evidence of several CO2 oscillations with an amplitude of ca. 50 ppm. Each change lasted on the order of a few centuries. A mechanism by which circulation changes in the high-latitude ocean could lead to rapid variations in atmospheric CO2 is proposed. In the Antarctic Ocean a slowing down of the vertical mixing would imply a smaller upward flux of sigma CO2 and nutrients. Assuming constant productivity, sigma CO2 and nutrients would be more completely used which would imply lower CO2 in these high-latitude surface waters. In areas with a warm surface, a slowing down of the circulation would not have a direct impact on CO2 because productivity would automatically decrease by the same factor as the upwelling rate of nutrients. Studies with a simple box model of the ocean-atmosphere system suggest that a suddent decrease by a factor of 2 of the water exchange between the surface and deep sea in high latitudes could lead to a GO2 decrease of ca. 40 to 50 ppm with a time constant of ca. 200 years. Deep-sea sediment studies indicate rapid changes in the high-latitude surface conditions of the North Atlantic and the Antarctic Oceans at the end of the last glaciation. Studies of carbon isotope ratios should help ascertain whether this proposed mechanism was indeed responsible for the CO2 variation.
M.G.

N85-26039*# National Center for Atmospheric Research, Boulder, Colo.
OCEAN MODELING OF THE NORTH ATLANTIC
Albert J. Seminar *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 33-35 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08J

Present modeling of the North Atlantic is inadequate and can be improved in a number of ways. A number of important physical

processes are listed in five categories from the viewpoints of how they are treated in isolation, how they are usually represented in present ocean basin models, and how they may be better represented in future models. In the first two categories of vertical boundary processes and internal vertical mixing, parameterizations exist which can easily be incorporated into models and which will have important effects on the simulated structure of the North Atlantic. For the third catagory (mesoscale eddy effects), adequate parameterizations do not exist; but the order of magnitude of the effects is known from observational and process-model studies. A horizontal grid spacing of 100 km or less in required to allow parameterizations with this order of magnitude, as well as to resolve the time-averaged ocean fields. In the fourth category of large scale transports improvements are suggested by way of increased vertical resolution and by the requirement that lateral mixing due to eddies takes place on isopycnal surfaces. Model incorporation of the latter phenomenta is underway. In the fifth category of miscellaneous high-latitude processes, formulations for the treatment of sea ice are available for use. However, the treatment of gravitational instability, which is crucial to deepwater formation in the Atlantic Ocean, will require additional refinements to account for the unresolved physics of chimney formations in the open ocean and buoyant plumes near ocean boundaries. M.G.

N85-26040*# Illinois Univ., Urbana. Dept. of Atmospheric Sciences.

NUMERICAL SIMULATION OF NORTH ATLANTIC SEA ICE VARIABILITY, 1951 - 1980

John E. Walsh *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 36-38 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08J

A two-level dynamic-thermodynamic sea ice model is used to simulate the growth, drift and decay of sea ice in the Northern Hemisphere during a 30-year period, 1951 to 1980. The model is run with a daily timestep on a 222 km grid and is forced by interanually varying fields of geostrophic wind and temperature-derived thermodynamic fluxes. The objective is a quantitative description of large-scale sea ice variability in terms of the dynamic and thermodynamic processes responsible for the fluctuations, especially in the North Atlantic where sea ice represents a substantial input of fresh water. The fields of ice velocity and thickness contain strong seasonal as well as interannual variability. The mean drift pattern results in thicknesses of 4 to 5 m offshore of northern Canada and Greenland, while winter thicknesses of approximately 2 m are typical of Alaskan. Eurasian and East Greenland coastal waters. The 30-year mean fields are characterized by ecessive ice in the North Atlantic during winter and by a summer retreat that is more rapid than observed. B.G.

N85-26041*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

POSSIBLE SEA ICE IMPACTS ON OCEANIC DEEP CONVECTION

Claire L. Parkinson *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 39-41 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08J

Many regions of the world ocean known or suspected to have deep convection are sea-ice covered for at least a portion of the annual cycle. As this suggests that sea ice might have some impact on generating or maintaining this phenomenon, several mechanisms by which sea ice could exert an influence are presented in the following paragraphs. Sea ice formation could be a direct causal factor in deep convection by providing the surface density increase necessary to initiate the convective overturning. As sea ice forms, either by ice accretion or by in situ ice formation in open water or in lead areas between ice floes, salt is rejected to the underlying water. This increases the water salinity, thereby increasing water density in the mixed layer under the ice. A sufficient increase in density will lead to mixing with deeper waters, and perhaps to deep convection or even bottom water formation. Observations are needed to establish whether this process is actually occurring; it is most likely in regions with extensive ice formation and a relatively unstable oceanic density structure. B.G.

N85-26042*# Lamont-Doherty Geological Observatory, Palisades, N. Y.

SEA ICE, CLIMATE AND FRAM STRAIT

Kenneth Hunkins *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 42-44 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08J

When sea ice is formed the albedo of the ocean surface increases from its open water value of about 0.1 to a value as high as 0.8. This albedo change effects the radiation balance and thus has the potential to alter climate. Sea ice also partially seals off the ocean from the atmosphere, reducing the exchange of gases such as carbon dioxide. This is another possible mechanism by which climate might be affected. The Marginal Ice Zone Experiment (MIZEX 83 to 84) is an international, multidisciplinary study of processes controlling the edge of the ice pack in that area including the interactions between sea, air and ice. B.G.

N85-26043*# Copenhagen Univ. (Denmark). Dept. of Physical Glaciology.

GREENLAND ICE SHEET MASS BALANCE

Niels Reeh *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 45-49 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08L

Mass balance equation for glaciers; areal distribution and ice volumes; estimates of actual mass balance; loss by calving of icebergs; hydrological budget for Greenland; and temporal variations of Greenland mass balance are examined. B.G.

N85-26044*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

POTENTIAL CLIMATIC EFFECTS ON THE GREENLAND ICE SHEET **c47**

Robert A. Bindschadler *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 50 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 04B

The Greenland Ice Sheet covers an area of 1,720,000 sq. km and contains approximately 2,600,000 cu km of ice. Most of the ice sheet receives an excess of snow accumulation over the amount of ice lost to wind, meltwater run-off or other ablative processes. The majority of mass loss occurs at the margin of the ice sheet as either surface melt, which flows into the sea or calving of icebergs from the tongues of outlet glaciers. Many estimates of these processes were published. An average of five published estimates is summarized. If these estimates are correct, then the Greenland Ice Sheet is in approximate equilibrium and contributes 490 cu km/a of fresh water to the North Atlantic and Arctic Oceans. Climate effects, ice sheet flow, and application of remote sensing to tracking of the ice sheet are discussed. B.G.

N85-26045*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.

CLIMATIC IMPACT OF A CHANGE IN NORTH ATLANTIC DEEP WATER FORMATION **c47**

David Rind *In its* North Atlantic Deep Water Formation Dec. 1984 p 51-54 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 04B

The response of the ocean to climate changes is one of the most uncertain questions regarding the impact of increasing CO2 on climate and society. North Atlantic deep water (NADW) formation apparently depends on a complex confluence of different water masses originating in different areas, all of which will presumably be affected by changes in wind, evaporation, etc., as the atmosphere warms. To analyze from first principles what the effect will be on NADW formation is a task which requires an ocean modeling capability not yet available. As a substitute, past climates can be investigated to see if there is any evidence for alterations in NADW formation. In addition, the possible impact of such

changes on climate can be explored. An estimate of NADW sensitivity (at least in the past) and of the climate consequences can be studied. The North Atlantic surface water temperatures can be reconstructed to indicate a substantial cooling between 11,000 and 10,000 years B.P. Were NADW formation to have ceased, it would have resulted in cooler surface waters; whether the reconstructed temperatures were due to this or some other effect cannot be determined at this time. Nevertheless, it was decided that it would be useful to see what the effect these colder temperatures would have had on the climate. B.G.

N85-26046*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ORIGIN OF THE GREENLAND ICE SHEET
Gerald R. North *In* NASA. Goddard Inst. for Space Studies North Atlantic Deep Water Formation Dec. 1984 p 55-61 refs (For primary document see N85-26028 15-48)
Avail: NTIS HC A04/MF A01 CSCL 08K

A climate model resolving the seasonal cycle and the two horizontal dimensions was developed and applied to several problems of current interest. Models of this type are useful when for various reasons a general circulation model experiment is not warranted or not feasible. For example, in cases where the signal to natural variability is small it may be advantageous to first consider such a statistical dynamical model because extremely long runs may be necessary in the application. In this case the simpler statistical dynamical model serves as a pilot study device. The model developed is a thermodynamic model whose solution yields the equilibrium seasonal cycle for the surface temperature field over the globe. The model is essentially a statement of the conservation of heat energy for individual columns of the earth atmosphere system. Various terms such as the infrared radiation flux to space are parameterized with earth radiation budget data from satellites such as Nimbus 6. The primary agent modulating the seasonal cycle amplitude is the heat capacity per unit area which is a strong function of surface type -- ocean surface can store 60 times more heat per unit time than land. By adjusting its few empirical parameters the model can be brought into remarkable agreement with the observed seasonal cycle. The model is then very useful for looking at the dependence of the seasonal cycle of the temperature on such externally defined variables as the Earth's orbital elements (eccentricity, tilt, precession of equinoxes) or the configuration of land-sea geography which can be changed by continental drift. B.G.

N85-26047*# National Aeronautics and Space Administration, Washington, D. C.
SPACE METHODS IN OCEANOLOGY
A. A. Bolshakov Mar. 1985 47 p refs Transl. into ENGLISH of the book "Kosmicheskiye Metody v Okeanologii, No. 6" Moscow, Znaniye, 1982 p 1-58; 64 Transl. by The Corporate Word, Pittsburgh
(Contract NASw-4006)
(NASA-TM-77652; NAS 1.15:77652) Avail: NTIS HC A03/MF A01 CSCL 08J

The study of Earth from space with specialized satellites, and from manned orbiting stations, has become important in the space programs. The broad complex of methods used for probing Earth from space are different methods of the study of ocean, dynamics. The different methods of ocean observation are described. E.A.K.

N85-26048*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
CONTAMINATION OF THE FETCH-LIMITED DIRECTIONAL WAVE SPECTRUM BY WAVES EMANATING FROM AN EMBAYMENT
E. J. Walsh, D. W. Hancock, III, D. E. Hines, and R. N. Swift (EG&G Washington Analytical Services Center, Inc.) [1985] 6 p (NASA-TM-84441; NAS 1.15:84441) Avail: NTIS HC A02/MF A01 CSCL 08C

The Surface Contour Radar (SCR) was used to map the evolution of the fetch-limited directional wave spectrum (DWS) off the eastern seaboard. Flight lines were displaced both north and south of the Delaware Bay following the passing of a weather front. The near shore DWS was found to be dominated by waves emanating from the Delaware Bay for distances of at least 85 km up the coastline and out to sea for 200 km from the mouth of the bay. E.A.K.

N85-26049# Naval Postgraduate School, Monterey, Calif.
REAL-TIME ENHANCEMENT OF A CLIMATOLOGY OR FORECAST OF OCEAN THERMAL STRUCTURE USING OBSERVED OCEAN TEMPERATURES M.S. Thesis
K. D. Pollak Jun. 1984 66 p
(AD-A151118) Avail: NTIS HC A04/MF A01 CSCL 08/10

Vertical temperature profiles observed in the eastern North Pacific were used to examine the feasibility of extrapolating an observation from one location to another. The technique, referred to as simple enhancement, is a special case of the Gandin (1963) optimum interpolation methodology. Application to Navy ASW (Antisubmarine Warfare) operations is considered. The technique requires the use of a trial value and a local observation. Trial values are obtained from a climatology and a synoptic analysis/forecast system provided by the Fleet Numerical Oceanography Center. An enhanced temperature profile is calculated by adding an observed anomaly (i.e., observation minus trial value) to the trial value at the desired location. Calculations of mean and RMS errors indicate that simple enhancement can provide a closer estimate to actual conditions than unenhanced climatology. The mixed layer depth cannot be extrapolated accurately to new locations presumably due to mesoscale eddies, fronts, internal waves and small scale fluctuations at the base of the mixed layer. Experiments at different locations and seasons would be required for a complete assessment of the application to ASW operations. GRA

N85-26050# Lamont-Doherty Geological Inst., Palisades, N. Y.
ON GEOID HEIGHTS AND FLEXURE OF THE LITHOSPHERE AT SEAMOUNTS
A. B. Watts and N. M. Ribe 10 Dec. 1984 21 p Repr. from Jnl. of Geophysical Research, v. 89, no. B13, 10 Dec. 1984 p 11152-11170
(Contract N00014-80-C-0098)
(AD-A151220; LDGO-3708) Avail: NTIS HC A02/MF A01 CSCL 08/5

The sea suface height has now been mapped to an accuracy of better than + or - 1 m by using radar altimeters on board orbiting satellites. The major influence on the mean sea surface height is the marine geoid which is an equipotential surface. We have carried out preliminary studies of how oceanic volcanoes, which rise above the ocean floor as isolated seamounts and oceanic islands or linear ridges, contribute to the marine geoid. Simple one and two dimensional models have been constructed in which it is assumed that the oceanic lithosphere responds to volcanic loads as a thin elastic plate overlying a weak fluid substratum. Previous studies based on graviity and bathymetry data and uplift/subsidence patterns show that the effective flexural rigidly of oceanic lithosphere and the equivalent elastic thickness T sub e increase with the age of the lithosphere at the time of loading. This models predict that isolated seamounts emplaced on relatively young lithosphere on or near a mid-ocean ridge crest will be associated with relatively low amplitude geoid anomalities (about 0.4-0.5 m/km of height), while seamounts formed on relatively low over the Mid- Pacific Mountains and Line Islands, which formed on or near a mid-ocean ridge crest, and relatively high over the Magellan Seamounts and Wake Guyots, which formed off ridge. GRA

N85-26051# Coastal Engineering Research Center, Vicksburg, Miss.
DEEPWATER WIND WAVE GROWTH WITH FETCH AND DURATION Final Report
C. L. Vincent Nov. 1984 35 p
(AD-A151604; CERC-MP-84-13) Avail: NTIS HC A03/MF A01 CSCL 08/3

A simple method for estimating wave height and period for

fetch- and duration-limited conditions is developed from the field studies of Mitsuyasu and Hasselman. The velocity scaling is effectively based on friction velocity which allows incorporation of effects due to temperature stratification in the atmospheric boundary layer and variation in the coefficient of drag with wind speed. The method is the analytical equivalent of the growth relationship used in the US Army Corps of Engineers numerical wave prediction studies. It is intended for use in short fetch (200 km) or less situations. Contents: Atmospheric Boundary Layer; Wave Growth Formulae; Wave Growth Curves; Determination of Fetch; Wind Estimation and Wind Speed Adjustment. GRA

N85-26052# Georgia Marine Science Center, Savannah.
OCEAN CIRCULATION AND METEOROLOGY OFF THE GEORGIA COAST. PART 1: REAL-TIME TELEMETRY SYSTEM FOR DATA COLLECTION
F. B. Schwing, J. O. Blanton, L. Lamhut, L. H. Knight, and C. V. Baker 1984 170 p refs Prepared in cooperation with Skidaway Inst. of Oceanography
(Contract DE-AS09-80EV-10331)
(PB85-155935; TRS-84-1-Pt-1) Avail: NTIS HC A08/MF A01 CSCL 08J

The design, operation, and use in oceanographic research of a fixed platform located about 17 km offshore of Savannah, Georgia are described. The present configuration of sensors and the data acquisition system for SNLT is discussed. Some detailed analyses of oceanographic and meteorological data acquired at SNLT are given. These analyses are summarized by describing monthly summaries of data, seasonal differences in wind-generated currents off Georgia, and examples of the use of such data. Author (GRA)

N85-25923# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
AN EXPERIMENTAL STUDY OF BRINE UPWARD MIGRATION IN THIN SEA ICE
Takashi Kasai and Nobuo Ono *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 149-155 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

N85-25925# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
CHARACTERISTICS OF FAST SEA ICE COLLECTED NEAR BARROW, ALASKA
Toshiyuki Kawamura *In its* Low Temp. Sci. Ser. A: Phys. Sci. 1984 p 163-169 refs In JAPANESE; ENGLISH summary (For primary document see N85-25917 15-42)
Avail: NTIS HC A09/MF A01

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N85-26053 Central Electricity Generating Board, London (England).
TWO-PHASE FLOW IN CENTRIFUGAL PUMPS
I. Kosmowski 7 Mar. 1985 13 p refs Transl. into ENGLISH from Maschinenbautech. (East Germany), v. 29, no. 8, 1980 p 361-365
(BLL-CE-Trans-8065-(9022.09)) Avail: British Library Lending Div., Boston Spa, England

To determine the specific energy of centrifugal pumps in two phase flow, it is necessary to consider a logarithmic term. Analysis of the energy computation with and without slip between the gas and liquid phase showed that under real conditions higher energy levels are achieved than is determined from homogeneous observation of two phase flow. As a result, there is a safety margin in the zero-slip computation of pump flow used in practice. The falling away observed in centrifugal pump characteristics as the gas volume flow fraction increases can be attributed to peculiarities in the behavior of two phase flows, which demands corresponding pump design. The selection of vane angle can also influence pump performance. A comparison of impellers with vane outlet angles of Beta sub 2=30 and 90 deg. shows the influence of decreased output in two-phase flow. In some cases it is necessary to assume a considerable falling away in the theoretical characteristic due to the greater decreased output with backwards-curved blading. The decreased output is dependent on the gas volume flow fraction and the flow rate. Author

N85-26054*# National Aeronautics and Space Administration, Washington, D. C.
NASA SPACE BIOLOGY PROGRAM: 9TH ANNUAL SYMPOSIUM Abstracts Only
Thora W. Halstead Apr. 1985 128 p refs Symp. held in Harper's Ferry, W. Va., 6-9 Nov. 1984
(NASA-CP-2336; NAS 1.55:2336) Avail: NTIS HC A07/MF A01 CSCL 06C

Topics covered include plant and animal gravity receptors and transduction; the role of gravity in growth and development of plants and animals; biological support structures and the role of calcium; mechanisms and responses of gravity sensitive systems; and mechanisms of plant responses to gravity. For individual titles, see N85-26055 through N85-26106.

N85-26055*# Michigan Univ., Ann Arbor. Dept. of Anatomy.
MAMMALIAN GRAVITY RECEPTORS: STRUCTURE AND METABOLISM Abstract Only
Muriel D. Ross *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 5-6 (For primary document see N85-26054 15-51)
(Grant NsG-9047)
Avail: NTIS HC A07/MF A01 CSCL 06C

Calcium metabolism in mammalian gravity receptors is examined. To accomplish this objective it is necessary to study both the mineral deposits of the receptors, the otoconia, and the sensory areas themselves, the saccular and utricular maculas. The main focus was to elucidate the natures of the organic and inorganic phases of the crystalline masses, first in rat otoconia but more recently in otoliths and otoconia of a comparative series of vertebrates. Some of the ultrastructural findings in rat maculas, however, have prompted a more thorough study of the organization of the hair cells and innervation patterns in graviceptors.
Author

N85-26056*# Eastern Virginia Medical School, Norfolk. Dept. of Pathology.
EFFECTS OF WEIGHTLESSNESS OF AURELIA EPHYRA DIFFERENTIATION AND STATOLITH SYNTHESIS Abstract Only
Dorothy B. Spangenberg *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 7-8 refs (For primary document see N85-26054 15-51)
(Grant NAGw-530)
Avail: NTIS HC A07/MF A01 CSCL 06C

Aurelia polyps are especially suited for space flight experiments because they are very small (2 to 4 mm), form ephyrae with gravity sensing structures in 6 to 7 days, and can be reared easily and inexpensively in the laboratory. During iodine-induced metamorphosis ephyrae develop in sequential order from the oral to the aboral end of the polyps. Eight sites of gravity receptors (rhopalia) form per ephyra. These structures have sacs of statoliths at their distal end, which are composed of calcium sulfate dihydrate. Only one statolith forms per cell (statocyte) and the cells collect at the distal end of the rhopalia forming statocysts. Rhopalia with statocysts are necessary for the righting reflex of swimming medusae. Using the Aurelia Metamorphosis Test System (Spangenberg, 1984) for the past eight months, the effects of clinostat rotation in the horizontal and vertical planes on the development of ephyrae and the synthesis of their statoliths were investigated.
Author

N85-26057*# Millsaps Coll., Jackson, Miss. Dept. of Biology.
GRAVITY PERCEPTION IN A CLADOCERAN-ZOOPLANKTER: ANATOMY OF ANTENNAL SOCKET SETAE OF DAPHNIA MAGNA Abstract Only
Dewey G. Meyers *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 9 (For primary document see N85-26054

15-51)
(Grant NAGw-643)
Avail: NTIS HC A07/MF A01 CSCL 06C

Night orientation in Daphnia magna was recently associated with setae on the basal socket of the swimming antennae. Daphnids are suspected of maintaining nocturnal equilibrium by monitoring the gravity vector through upward setal deflections caused by sinking between antennal swimming strokes. Setae appear to be hydrodynamic rheoceptors that sense the gravity vector indirectly by mechanoreceptivity to the direction and velocity of water currents. Neuroanatomical stains have revealed cell bodies at the base of the setal shafts, dendritic connections through to the distal ends of the shafts, and axonal tracts around the antennal socket connecting with an additional cell body and continuing toward the brain. These anatomical observations combined with previous scanning electron microscopy studies suggest that the setae are similar to mechanoreceptors and proprioceptors used by higher crustaceans to sense water currents and gravity, and maintained balance. Author

N85-26058*# Temple Univ., Philadelphia, Pa.
GRAVITY PERCEPTION AND CARDIAC FUNCTION IN THE SPIDER Abstract Only
Alfred Finck *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 10 (For primary document see N85-26054 15-51)
(Grant NAGw-242)
Avail: NTIS HC A07/MF A01 CSCL 06C

The following features of the arachnid gravity system were studied. (1) the absolute threshold to hyper-gz is quite low indicating fine proprioreceptive properties of the lyriform organ, the Gz/vibration detector; (2) the neurogenic heart of the spider is a good dependent variable for assessing its behavior to Gz and other stimuli which produce mechanical effects on the exoskeleton; (3) Not only is the cardiac response useful but it is now understood to be an integral part of the system which compensates for the consequences of gravity in the spider (an hydraulic leg extension); and (4) a theoretical model was proposed in which a mechanical amplifier, the leg lever, converts a weak force (at the tarsus) to a strong force (at the patella), capable of compressing the exoskeleton and consequently the lyriform receptor. Author

N85-26059*# Cornell Univ., Ithaca, N.Y.
AMYLOPLAST SEDIMENTATION KINETICS IN CORN ROOTS Abstract Only
A. Carl Leopold and Fred Sack *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 13-14 (For primary document see N85-26054 15-51)
(Grant NAGw-3)
Avail: NTIS HC A07/MF A01 CSCL 06C

Knowledge of the parameters of amyloplast sedimentation is crucial for an evaluation of proposed mechanisms of root graviperception. Early estimates of the rate of root amyloplast sedimentation were as low as 1.2 micron/min which may be too slow for many amyloplasts to reach the vicinity of the new lower wall within the presentation time. On this basis, Haberlandt's classical statolith hypothesis involving amyloplast stimulation of a sensitive surface near the new lower wall was questioned. The aim was to determine the kinetics of amyloplast sedimentation with reference to the presentation time in living and fixed corn rootcap cells as compared with coleoptiles of the same variety. Author

N85-26060*# Yale Univ., New Haven, Conn. Dept. of Biology.
POLYAMINES AS POSSIBLE MODULATORS OF GRAVITY INDUCED CALCIUM TRANSPORT IN PLANTS Abstract Only
Arthur W. Galston and Robert D. Slocum *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 15 refs (For primary document see N85-26054 15-51)
Avail: NTIS HC A07/MF A01 CSCL 06C

Data from various laboratories indicate a probable relationship between calcium movement and some aspects of graviperception and tropistic bending responses. The movement of calcium in response to gravistimulation appears to be rapid, polar and opposite in direction to polar auxin transport. What might be the cause of such rapid Ca(2+) movement? Data from studies on polyamine (PA) metabolism may furnish a clue. A transient increase in the activity of ornithine decarboxylase (ODC) and titers of various PAs occurs within 60 seconds after hormonal stimulation of animal cells, followed by Ca(2+) transport out of the cells. Through the use of specific inhibitors, it was shown that the enhanced PA synthesis from ODC was essential not only for Ca(2+) transport, but also for Ca(2+) transport-dependent endocytosis and the movement of hexoses and amino acids across the plasmalemma. In plants, rapid changes in arginine decarboxylase (ADC) activity occur in response to various plant stresses. Physical stresses associated with gravisensor displacement and reorientation of a plant in the gravitational field could similarly activate ADC and that resultant increases in PA levels might initiate transient perturbations in Ca(2+) homeostasis. B.G.

N85-26061*# Texas Univ., Austin. Dept. of Botany.
CALCIUM AND CALMODULIN LOCALIZATION IN GRAVITROPICALLY-RESPONDING PLANT ORGANS Abstract Only
Stanley J. Roux *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 16-17 (For primary document see N85-26054 15-51)
(Grant NsG-7480)
Avail: NTIS HC A07/MF A01 CSCL 06C

Antimonate staining procedures were used to detect calcium redistribution changes in corn roots. Results show that an asymmetric redistribution of Ca is induced by a gravitropic stimulus in roots as it is in shoots. Since this response occurs within 10 min, at least 5 min before any visible bending, it could play a role in the regulation of root gravitropism. Two different general approaches were used to localize calmodulin in plant tissue: radioimmunoassay of its content in tissue and in purified subcellular organelles, and immunocytochemical detection of it in roots and coleoptiles. Radioimmunoassay results indicate that calmodulin is present in large quantities in plant cells and that it is specifically associated with mitochondria, etioplasts and nuclei. An assayed of an extract of soluble wall proteins revealed that over 1% of these proteins was calmodulin. Controls indicate that this calmodulin is not cytoplasmic in origin. A reaction product from anti-calmodulin was found mainly in the root cap cells, moderately in metazylem elements, in some cells in the stele surrounding metaxylem elements and in cortical cells. A.R.H.

N85-26062*# Ohio State Univ., Columbus.
THE INTERACTION OF CALCIUM AND AUXIN IN THE GRAVITROPIC RESPONSE OF ROOTS Abstract Only
Michael L. Evans *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 18-19 refs (For primary document see N85-26054 15-51)
(Grant NAGw-297)
Avail: NTIS HC A07/MF A01 CSCL 06C

The role of calcium redistribution in the responding region of the root is examined, however, the potential connection between calcium and auxin redistribution in the elongation zone is not found. The following items are examined: (1) the effect of gravity on calcium movement across the elongation zone; (2) the effect of gravity on auxin movement across the elongation zone; and (3) the effect of calcium on auxin movement across the elongation zone. It is indicated that gravistimulation induces a physiological asymmetry in the auxin transport system of maize roots and that calcium increases the total transport of auxin across the root. Gravistimulation is apparently necessary for the enhancing effect of calcium on lateral auxin movement, and it is possible that the preferential downward movement of calcium across the elongation zone of gravistimulated roots plays a role in establishing the auxin asymmetry proposed to cause positive gravitropic curvature.E.A.K.

N85-26063*# Kenyon Coll., Gambier, Ohio.
TRANSDUCTION OF THE ROOT GRAVITROPIC STIMULUS: CAN APICAL CALCIUM REGULATE AUXIN DISTRIBUTION? Abstract Only
Kathryn L. Edwards *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 20-21 (For primary document see N85-26054 15-51)

(Grant NAGw-368)
Avail: NTIS HC A07/MF A01 CSCL 06C

The hypothesis was tested that calcium, asymmetrically distributes in the root cap upon reorientation to gravity, affects auxin transport and thereby auxin distribution at the elongation zone. It is assumed that calcium exists in the root cap and is asymmetrically transported in root caps altered from a vertical to a horizontal position and that the meristem, the tissue immediately adjacent to the root cap and lying between the site of gravity perception and the site of gravity response, is essential for mediation of gravitropism. Tip calcium in root gravicurvature was implicated. The capstone evidence is that the root cap has the capacity to polarly translocate exogenous calcium downward when tissue is oriented horizontally, and that exogenous calcium, when supplied asymmetrically at the root tip, induces curvature and dictates the direction of curvature in both vertical and horizontal corn roots. E.A.K.

N85-26064*# Michigan State Univ., East Lansing. Dept. of Botany and Plant Pathology.
ATTEMPTS TO LOCALIZE AND IDENTIFY THE GRAVITY SENSING DEVICE OF PLANT SEEDLINGS Abstract Only
Robert S. Bandurski, A. Schulze, Y. Momonoki, M. Desrosiers, and D. Fearn-Desrosiers *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 22-23 refs (For primary document see N85-26054 15-51)
(Grant NAGw-97)
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The growth hormone asymmetry develops within three minutes following the initiation of the gravitational asymmetry and radio-labeled compounds being transported from the seed to the shoot also show asymmetric distribution. It is found that the target of the gravity stimulus resides primarily in the permability of the vascular tissue that regulates the supply of hormone to the surrounding tissues. It is hypothesized that the gravitational stimulus induces an asymmetric change in the rate of secretion of the growth hormone, IAA, from the vascular tissue into the surrounding cortical cells. More hormone would be secreted from the vascular stele proximal to the lower side of a horizontally placed plant shoot than from the upper side. This results in more growth hormone in the lower cortical (plus epidermal) cells, and ultimately more growth, such that the plant grows asymmetrically and, ultimately attain its normal vertical orientation. A theory was developed of how plants respond to the gravitational stimulus. The theory is based upon the analytical results concerning the effects of gravity on the distribution of the plant growth hormone, IAA, in both its free and conjugated forms, and upon the effect of the growth stimulis on the distribution of externally applied radio-labeled compounds. Its advantage is that it is testable and that it is built upon solid knowledge of the effects of the gravitational stimulus upon the endogenous growth hormone, IAA, and upon the distribution of externally applied radio-labeled compounds. E.A.K.

N85-26065*# San Diego State Univ., Calif.
ROLE OF Ca++ IN SHOOT GRAVITROPISM Abstract Only
David L. Rayle *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 24-25 (For primary document see N85-26054 15-51)
(Grant NAGw-230)
Avail: NTIS HC A07/MF A01 CSCL 06C

A cornerstone in the argument that Ca(2+) levels may regulate growth is the finding the EGTA promotes straight growth. The usual explanation for these results is that Ca(2+) chelation from cell walls results in wall loosening and thus accelerated straight growth. The ability of frozen-thawed Avena coleoptile tissue (subjected to 15g tension) to extend in response to EGTA and Quin II was examined. The EGTA when applied in weakly buffered (i.e., 0.1mM) neutral solutions initiates rapid extension. When the buffer strength is increased, similar concentrations of EGTA produce no growth response. This implies when EGTA liberated protons are released upon Ca(2+) chelation they can either initiate acid growth (low buffer conditions) or if consumed (high buffer conditions) have no effect. Thus Ca(2+) chelation in itself apparently does not result in straight growth. Author

N85-26066*# California Univ., Berkeley. Dept. of Botany.
GRAVISTIMULUS PRODUCTION IN ROOTS OF CORN Abstract Only
Lewis J. Feldman *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 26-27 refs (For primary document see N85-26054 15-51)
(Grant NsG-239)
Avail: NTIS HC A07/MF A01 CSCL 06C

Because of the similarities in structure of known growth regulators, specifically abscisic acid and xanthoxin, with portions of the violaxanthin molecule, it was suggested that these growth substances normally arise from the breakdown or turnover of carotenoid. The light-induced disappearance of violaxanthin occurs in a time frame coincident with an increase in the levels in cap tissue of substances with growth inhibitor properties. One of the ways by which light may regulate root development, including aspects of gravitropism, is through the production of inhibitory growth substances arising from the turnover of carotenoids.Author

N85-26067*# Washington Univ., St. Louis, Mo.
A POSSIBLE EXPLANATION OF WHY GRAVITROPIC GROWTH IS DETECTED EARLIER THAN STRAIGHT GROWTH Abstract Only
Barbara G. Pickard *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 28-29 (For primary document see N85-26054 15-51)
(Grant NAGw-420)
Avail: NTIS HC A07/MF A01 CSCL 06C

The mechanism of gravitropic gravity reception by seedling shoots was examined. Gravitropism is mediated by lateral migration of the auxin IAA. The 10 min. lag for induction of growth by IAA helps to explain auxin action. Evidences for the rapicity of gravitropism are examined. B.G.

N85-26068*# State Univ. of New York, Stony Brook.
DAYLILY AS A SYSTEM TO STUDY EFFECTS OF SPACE FLIGHT ON PLANT DEVELOPMENT Abstract Only
Abraham D. Krikorian *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 33-34 (For primary document see N85-26054 15-51)
(Grant NsG-7270)
Avail: NTIS HC A07/MF A01 CSCL 06C

The intent of the protoplast experimentation was to develop a system which would permit work with wall less counterparts of totipotent free cells as a model for a fertilized egg cell. It is clear that the daylily system is becoming a valuable tool with which to study any number of basic phases of higher plant development. The system can now be studied from a number of perspectives. A system amenable to rigorous experimentation was developed and can be used as a point of departure for studying problems of development in the space environment. This will be a prelude to the studying of the effect of hypogravity on higher plant development. E.A.K.

N85-26069*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE ROLE OF GRAVITY ON THE REPRODUCTION OF ARABIDOPSIS PLANTS Abstract Only
Takashi Hoshizaki *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 35-36 (For primary document see N85-26054 15-51)
(Contract NAS7-918)
Avail: NTIS HC A07/MF A01 CSCL 06C

The presence of gravity as a necessary environmental factor for higher plants to complete their life cycle was examined. Arabidopsis thalliana (L.) Heynh. Columbia strain plants were grown continuously for three generations in a simulated micro-g environment as induced by horizontal clinostats. Growth, development and reproduction were followed. The Arabidopsis plants were selected for three generations on clinostats because: (1) a short

life cycle of around 35 days; (2) the cells of third generation plants would in theory be free of gravity imprint; and (3) a third generation plant would therefore more than likely grow and respond like a plant growing in a micro-g environment. It is found that gravity is not a required environmental factor for higher plants to complete their life cycle, at least as tested by a horizontal clinostat. Clinostatting does not prevent the completion of the plant life cycle. However, clinostatting does appear to slow down the reproductive process of Arabidopsis plants. Whether higher plants can continue to reproduce for many generations in a true micro-g environment of space can only be determined by long duration experiments in space. E.A.K.

N85-26070*# Pennsylvania Univ., Philadelphia.
IMPORTANCE OF GRAVITY FOR PLANT GROWTH AND BEHAVIOR Abstract Only
Allan H. Brown (University City Science Center) *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 37-39 refs (For primary document see N85-26054 15-51)
(Grants NGR-39-010-149; NGR-39-030-010)
Avail: NTIS HC A07/MF A01 CSCL 06C

Flight experiments on the importance of gravity to plant growth and behavior are reported. The following studies were undertaken: (1) hyperastic responses to incremental changes of an axially imposed centripetal force; (2) Spacelab-1 experiments, methods for preparing soil in flight hardware containers were impound, to ensure desired moisture content and minimal contamination probability; (3) mesocotyl growth patterns were established by Avena lore exposure to red light during early seedling outogency; (4) the development of flight hardware; (5) choice of member of seedlings in each cube; (6) data processing and reduction; (7) clinostat validation; circummutation in space was more vigorous than on Earth based clinostat. E.A.K.

N85-26071*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STRUCTURAL DEVELOPMENT AND GRAVITY Abstract Only
Emily Morey Holton *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 45-46 (For primary document see N85-26054 15-51)
Avail: NTIS HC A07/MF A01 CSCL 06C

Major research projects designed to elucidate the mechanisms by which gravity loading and/or fluid distribution alter bone formation and/or resorption in rat bone are reported. Projects completed include: (1) analysis of bone parameters in rats from 6 weeks to 68 weeks of age; (2) restricted access area in which rats on the model were not allowed to touch any side of the cage; and (3) the effect of dietary calcium levels on bone formation and resorption rates in controls and head-down rats. E.A.K.

N85-26072*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE ROLE OF VITAMIN D IN THE BONE CHANGES ASSOCIATED WITH SIMULATED WEIGHTLESSNESS Abstract Only
B. Halloran (California Univ., San Francisco), D. Bikle (VA Medical Center, San Francisco), E. Holton, M. Levens, and R. Globus *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 47-48 (For primary document see N85-26054 15-51)
(Grant NAGw-349)
Avail: NTIS HC A07/MF A01 CSCL 06C

The role of vitamin D in the change in bone metabolism was examined. The serum concentrations in rats sacrificed after 2, 5, 7, 10, 12 and 15 days of suspension was measured. Between days 1 and 5 of suspension and then gradually decreased towards normal between days 5 and 15. The time course of the changes in the circulating concentrations of 1,25(OH)2D and 24,25(OH)2D mirror almost precisely the changes in bone metabolism. The relationship between the changes in vitamin D metabolism and bone metabolism is investigated. Whether the bone changes are due to the change in serum concentration of 1,25(OH)2D or the changes in bone formation causing a reduction in Ca flux out of the serum pool and thereby suppressing 1,25(OH)2D production is examined. It is found that suspension had no effect on hormone concentration in the 1,25(OH)2D infused animals. Nevertheless, both vehicle and 1,25(OH)2D infused suspended rats exhibited the same reduction in bone mineral, and uptake of (45)Ca. It is suggested that the transitory reduction in circulating 1,25(OH)2D during suspension is not likely to cause the abnormalities in bone metabolism but rather that the changes in bone metabolism are primary and cause the fall in serum 1,25(OH)2D concentration. This supports the hypothesis that the metabolic abnormalities in bone associated with simulated weightlessness are due to the direct effect of unweighting on the bone. E.A.K.

N85-26073*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE SALUTARY EFFECT OF DIETARY CALCIUM ON BONE MASS IN A RAT MODEL OF SIMULATED WEIGHTLESSNESS Abstract Only
Daniel D. Bikle (VA Medical Center, San Francisco), Ruth Globus, Bernard Halloran (California Univ. Medical Center, San Francisco), and Emily Morey-Holton *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 49 (For primary document see N85-26054 15-51)
(Grant NAGw-236)
Avail: NTIS HC A07/MF A01 CSCL 06C

Whether supplementation of dietary calcium reduces the differences in bone mass of unweighed limbs and normally weighted limbs, and whether parathyroid hormone (PTH) and 1,25-dihydroxyvitamin D (1,25(OH)2D) respond differently to dietary calcium in unweighted animals in comparison with pair-fed controls was studied. The hind limbs of rats were unweighted by a tail suspension method and diets containing 0.1% to 2.4% calcium. After 2 weeks serum calcium, phosphorus, PTH and 1,25(OH)2D intestinal calcium transport were determined and bone mass, ash weight, and calcium in the tibia, L-1 vertebra, and humerus were measured. No significant differences in body weights were observed among the various groups. Suspended rats maintained constant levels of serum calcium and phosphate over the wide range of dietary calcium. Serum PTH and 1,25(OH)2D and intestinal calcium transport fell as dietary calcium was increased. Bone calcium in the tibia and vertebra from suspended rats remained less than that from pair-fed control. It is suggested that although no striking difference between suspended and control animals was observed in response to dieteary calcium, increasing dietary calcium may reduce the negative impact of unloading on the calcium content of the unweighted bones. The salutary effect of high dietary calcium appears to be due to inhibition of bone resorption rather than to stimulation of bone formation. E.A.K.

N85-26074*# University of the Pacific, San Francisco, Calif. Dept. of Orthodontics.
ACTUAL AND SIMULATED WEIGHTLESSNESS INHIBIT OSTEOGENESIS IN LONG BONE METAPHYSIS BY DIFFERENT MECHANISMS Abstract Only
W. Eugene Roberts *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 50-51 refs (For primary document see N85-26054 15-51)
(Grant NAGw-356)
Avail: NTIS HC A07/MF A01 CSCL 06C

Weightlessness and simulated weightlessness inhibit the rate of periosteal bone formation in long bones. Formation of pre-osteoblasts is suppressed in periodontal ligament (PDL) of maxillary molars, which suggests a generalized block in osteoblast histogenesis. Growth in length of long bones is decreased by simulated weightlessness, but there are no reliable data on the influence of actual weightlessness on metaphyseal growth. The nuclear size assay for assessing relative numbers of osteoblast precursor cells was utilized in the primary spongiosa of growing long bones subjected to actual and simulated weightlessness. It is found that: (1) Actual weightlessness decreases total number of osteogenic cells and inhibits differentiation of osteoblast precursor cells, (2) Simulated weightlessness suppresses only osteoblast differentation; and (3) The nuclear morphometric assay is an effective means of assessing osteogenic activity in the growing metaphysis or long bones. E.A.K.

N85-26075*# Columbia Univ., New York. Dept. of Anatomy/Cell Biology.
QUANTITATIVE ALTERATIONS IN THE FUNCTION OF BONE FORMING CELLS DUE TO REDUCED WEIGHT BEARING Abstract Only
Stephen B. Doty *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 52-53 refs (For primary document see N85-26054 15-51)
(Grant NAGw-238)
Avail: NTIS HC A07/MF A01 CSCL 06C

Rats subjected to spaceflight or suspended in a non-weight bearing position for 2 to 3 weeks, show a significant reduction in new bone formation. This reduction is associated with a decrease in akaline phosphatase activity in the differentiated osteoblast population. Those cells in the siaphyseal region of bone are more affected than the same cell type in metaphyseal bone. Measurements of alkaline phosphate activity in specific regions of bone, and the autoradiographic localization of H(3) proline in bone forming areas are described. Concomitant with decreased bone matrix synthesis, the osteoblast population also demonstrate changes in the Golgi/lysosomal complex as a result of whole animal suspension. Morphometric techniques are being applied for quantitation of the lysosomal population and the percentage of lysosomal or Golgi bodies containing acid phosphatase activity. M.G.

N85-26076*# California Univ., Berkeley.
NEW TECHNIQUES FOR STUDYING CALCIUM GRADIENTS Abstract Only
Roger Y. Tsien *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 54-55 (For primary document see N85-26054 15-51)
(Grant NAGw-515)
Avail: NTIS HC A07/MF A01 CSCL 06C

Improved techniques for detecting and manipulating spatial gradients of cytosolic free Ca(2+) concentrations (Ca(2)) sub i and intracellular stores are discussed. Three areas of progress are: (1) development of new fluorescent indicators for Ca(2+) that are the first to be suitable for measuring Ca(2+)) sub i and its inhomogeneities in individual cells; (2) invention of photolabile chelators which shift irreversibly from high to low affinity for Ca(2+) upon illumination, permitting light-controlled jumps in (Ca(2+)) sub i; and (3) fixation methods to trap dynamic intraorganellar Ca stores in a form readily visible by electron microscopy. M.G.

N85-26077*# Arizona Univ., Tucson. Dept. of Biochemistry.
ROLE OF GLUCOCORTICOIDS IN THE RESPONSE TO UNLOADING OF MUSCLE PROTEIN AND AMINO ACID METABOLISM Abstract Only
Marc E. Tischler and Stephens R. Jaspers *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 56-57 (For primary document see N85-26054 15-51)
(Grant NAGw-227)
Avail: NTIS HC A07/MF A01 CSCL 06C

Intact control (weight bearing) and suspended rats gained weight at a similar rate during a 6 day period. Adrenaectomized (adx) weight bearing rats gained less weight during this period while adrenalectomized suspended rats showed no significant weight gain. Cortisol treatment of both of these groups of animals caused a loss of body weight. Results from these studies show several important findings: (1) Metabolic changes in the extensor digitorum longus muscle of suspended rats are due primarily to increased circulating gluccorticoids; (2) Metabolic changes in the soleus due to higher steroid levels are probably potentiated by greater numbers of receptors; and (3) Not all metabolic responses in the unloaded soleus muscle are due to direct action of elevated glucocorticoids or increased sensitivity to these hormones. E.R.

N85-26078*# Texas Univ. Health Science Center, Dallas.
CONSTANT FIBER NUMBER DURING SKELETAL MUSCLE ATROPHY AND MODIFIED ARACHIDONATE METABOLISM DURING HYPERTROPHY Abstract Only
Gordon Templeton *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 58 (For primary document see N85-26054 15-51)
(Grant NAGw-140)
Avail: NTIS HC A07/MF A01 CSCL 06C

A previously documented shift from Type I to IIA predominance of the soleus muscle during rat suspension was further investigated to determine if this shift was by selective reduction of a single fiber type, simultaneous reduction and formation of fibers with different fiber types, or a transformation of fiber type by individual fibers. By partial acid digestion and dissection, average total soleus fiber number was found to be 3022 + or - 80 (SE) and 3008 + or - 64 before and after four-week suspension (n=12). Another area of current research was based on previous studies which indicate that prostaglandins are biosynthesized by skeletal muscle and evoke protein synthesis and degradation. Author

N85-26079*# Louisville Univ., Ky. Dept. of Physiology and Biophysics.
BLOOD PRESSURE RESPONSES AND MINERAL OCORTICOID LEVELS IN THE SUSPENDED RAT MODEL FOR WEIGHTLESSNESS Abstract Only
X. J. Musacchia and Joseph M. Steffen *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 59-60 (For primary document see N85-26054 15-51)
(Grant NsG-2325)
Avail: NTIS HC A07/MF A01 CSCL 06C

Cardiovascular responses and fluid/electrolyte shifts seen during space flight are attributed to cephalad redistribution of vascular fluid. The antiorthostatic (AO) rat (suspended head down tilted, 15-20 deg) is used to model these responses. Current studies show that elevated blood pressures in A0 rats are sustained for periods up to seven days. Comparisons are made with presuspension rats. Increased blood pressure in head down tilted subjects suggests a specific response to A0 positioning, potentially relatable to cephalad fluid shift. To assess a role for hormonal regulation of sodium excretion, serum aldosterone levels were measured. Author

N85-26080*# Arizona Univ., Tucson.
EFFECTS OF MUSCLE ATROPHY ON MOTOR CONTROL: CAGE SIZE EFFECTS Abstract Only
Douglas G. Stuart *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 61-62 refs (For primary document see N85-26054 15-51)
(Grant NAGw-338)
Avail: NTIS HC A07/MF A01 CSCL 06C

Two populations of male Sprague-Dawley rats were raised either in conventional minimum-specification cages or in a larger cage. When the animals were mature (125 to 150 d), the physiological status of the soleus (SOL) and extensor digitorum longus (EDL) muscles of the small- and large-cage animals were compared. Analysis of whole-muscle properties including the performance of the test muscle during a standardized fatigue test in which the nerve to the test muscle was subjected to supramaximal intermittent stimulation shows: (1) the amplitude, area, mean amplitude, and peak-to-peak rate of the compound muscle action potential decreased per the course of the fatigue test; (2) cage size did not affect the profile of changes for any of the action-potential measurements; (3) changes exhibited in the compound muscle action potential by SOL and EDL were substantially different; and (4) except for SOL of the large-cage rats, there was a high correlation between all four measures of the compound muscle action potential and the peak tetanic force during the fatigue test; i.e., either the electrical activity largely etermines the force profile during the fatigue test or else contractile-related activity substantially affects the compound muscle action potential. A.R.H.

N85-26081*# Vanderbilt Univ., Nashville, Tenn. School of Medicine.
INDUCED CHANGES IN THE CHOLINERGIC SYSTEM OF SCIATIC NERVE AND SLOW AND FAST TWITCH MUSCLE OF RATS Abstract Only
W. D. Dettbarn, R. C. Gupta, and K. E. Misulis *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 63-64 (For primary document see N85-26054 15-51)

(Grant NAG2-301)
Avail: NTIS HC A07/MF A01 CSCL 06C

Hindlimb suspension was used as a model of disuse in experiments studing the effects of reduced muscle activity on AChE and its molecular forms, choline acetyltransferase and nicotinic receptor binding in innervated slow and fast muscle. The weight of SOL was reduced to 64% within one week and continued to decrease progressively up to the third week when the weight was reduced to 40% as compared to controls. EDL showed a significant decrease in its weight only at the end of three weeks hypokinesia when it was reduced to 71% of control. Biochemical and histochemical findings are summarized. From these data and from morphological findings it is evident that some properties of skeletal muscles are strongly dependent on patterns and level of loadbearing and on motor unit activity. With suspension-induced disuse, the usually slow SOL appeared to change its characteristics such as fiber type distribution and AChE activity to one that more resembled a faster muscle. It is important to note that hypokinesia induced changes either physiological, biochemical or morphological, are totally reversible as the induced changes returned to control levels within a week after cessation of disuse. A.R.H.

N85-26082*# California Univ., Davis. Dept. of Animal Physiology.
THERMOREGULATORY AND VESTIBULAR SYSTEMS IN THE RAT Abstract Only
John M. Horowitz *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 67-68 (For primary document see N85-26054 15-51)
(Grant NsG-2234)
Avail: NTIS HC A07/MF A01 CSCL 06C

Responses in six rats to auditory and vestibular stimuli were compared at two temperatures. It was observed that the peaks in the BAER recorded at a brain temperature of approximately 34 degrees centigrade occur later in time than the peaks from the 37 degree waveforms. In addition, the later peaks of the BAER recorded at the low temperature were more delayed than the earlier peaks, indicating that the interpeak latency increases as brain temperature is decreased. Responses to angular acceleration also show that later peaks in the evoked waveforms are associated with increases in interpeak latencies with decreasing temperature. A.R.H.

N85-26083*# California Univ., San Francisco. Dept. of Physiology.
NEURAL MECHANISM BY WHICH GRAVITATIONAL STIMULUS AND STRESS AFFECT THE SECRETION OF RENIN AND OTHER HORMONES Abstract Only
William F. Ganong, Eiji Gotoh, and Richard H. Alper *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 69-70 (For primary document see N85-26054 15-51)
(Grant NAGw-490)
Avail: NTIS HC A07/MF A01 CSCL 06C

The serotonin-releasing drug p-chloroamphetamine (PCA), as well as L-propranolol and chloriasondamine were used in a study which established that the pathway from the hypothalamus to the kidneys is sympathetic. Which hypothalamic nuclei mediate the response to PCA is being investigated experiments are being conducted to determine a readily reproducible psychological stimulus to renin secretion that can be used in rats. The effects of equithesin, urethane, and inactin on plasma renin activity were examined in preparation for tilting experiments. The relation of vasopressin-secreting neurons in the brain sem to PCA response was explored in Brattleboro rats that are congenitally unable to produce vasopressin in their hypothalami. A.R.H.

N85-26084*# California Univ., Berkeley. Lab. of Environmental Physiology.
GRAVITY, BODY MASS AND COMPOSITION, AND METABOLIC RATE Abstract Only
Nello Pace and Arthur H. Smith (California Univ., Davis) *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 71-72 (For primary document see N85-26054 15-51)
(Grant NsG-7336)
Avail: NTIS HC A07/MF A01 CSCL 06C

Metabolic rate and body composition as a function of sex and age were defined in 5 species of common laboratory mammals, the mouse, hamster, rat, guinea pig and rabbit. Oxygen consumption and carbon dioxide production rates were measured individually in 6 male and 6 female animals for each of 8 age cohorts ranging from 1 month to 2 years, and for each of the species. From the results it is evident that among these small mammals there is no indication of scaling of muscularity to body size, despite the 100-fold difference in body mass represented by the skeletal musculature seems to reach a pronounced peak value at age 2 to 3 months and then declines, the fraction of the fat-free body represented by other body components in older animals must increase complementarily. Under normal gravity conditions muscularity in small laboratory mammals displays large, systematic variation as a function both of species and age. This variation must be considered when such animals are subjects of experiments to study the effects of altered gravitational loading on the skeletal musculature of the mammal. A.R.H.

N85-26085*# California Univ., Davis. Dept. of Animal Physiology.
HOMEOSTASIS IN PRIMATES IN THE HYPERDYNAMIC ENVIRONMENT Abstract Only
Charles A. Fuller *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 73-74 (For primary document see N85-26054 15-51)
(Grant NAGw-309)
Avail: NTIS HC A07/MF A01 CSCL 06C

The influence of chronic centrifugation upon the homestatic regulation of the circadian timekeeping system was examined. The interactions of body temperature regulation and the behavioral state of arousal were studied by evaluating the influence of cephalic fluid shifts induced by lower body positive air pressure (LBPP), upon these systems. The small diurnal squirrel monkey (Saimiri sciureus) was used as the non-human primate model. Results show that the circadian timekeeping system of these primates is functional in the hyperdynamic environment, however, some of its components appear to be regulated at different homeostatic levels. The LBPP resulted in an approximate 0.7 C decrease in DBT ($p < 0.01$). However, although on video some animals appeared drowsy during LBPP, sleep recording revealed no significant changes in state of arousal. Thus, the physiological mechanisms underlying this lowering of body temperature can be independent of the arousal state. A.R.H.

N85-26086*# Utah State Univ., Logan.
GRAVITROPISM IN LEAFY DICOT STEMS Abstract Only
Frank B. Salisbury *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 79-80 (For primary document see N85-26054 15-51)
(Grant NsG-7567)
Avail: NTIS HC A07/MF A01 CSCL 06C

A polarizing research microscope with rotating stage and associated camera equipment were ordered, and techniques of fixation and preparation of specimens were perfected for studying possible changes in orientation of cellulose microfibrils in cell walls of gravistimulated dicot stems. Acid ethephon solutions or acid without ethephon caused elongation of stem tissues where they were applied; stems bent away from the side of application. Acid solutions applied to the bottom of horizontal stems greatly delayed bending. Research in tissue sensitivity changes during gravitropic bending of soybean hypocotyls while immersed in auxin and in castor bean stems is also reported. A.R.H.

N85-26087*# Purdue Univ., Lafayette, Ind. Dept. of Horticulture.
MECHANICAL STRESS REGULATION OF PLANT GROWTH AND DEVELOPMENT Abstract Only
Cary A. Mitchell *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 81 (For primary document see N85-26054 15-51)
(Grant NsG-7278)

Avail: NTIS HC A07/MF A01 CSCL 06C

Growth dynamics analysis was used to determine to what extent the seismic stress induced reduction in photosynthetic productivity in shaken soybeans was due to less photosynthetic surface, and to what extent to lower efficiency of assimulation. Seismic stress reduces shoot transpiration rate 17% and 15% during the first and second 45 minute periods following a given treatment. Shaken plants also had a 36% greater leaf water potential 30 minutes after treatment. Continuous measurement of whole plant photosynthetic rate shows that a decline in CO2 fixation began within seconds after the onset of shaking treatment and continued to decline to 16% less than that of controls 20 minutes after shaking, after which gradual recovery of photosynthesis begins. Photosynthetic assimilation recovered completely before the next treatment 5 hours later. The transitory decrease in photosynthetic rate was due entirely to a two fold increase in stomatal resistance to CO2 by the abaxial leaf surface. Mesophyll resistance was not significantly affected by periodic seismic treatment. Temporary stomatal aperture reduction and decreased CO2 fixation are responsible for the lower dry weight of seismic stressed plants growing in a controlled environment. A.R.H.

N85-26088*# Wake Forest Univ., Winston-Salem, N.C. Dept. of Biology.

MUTANT PEAS AS PROBES IN THE UNDERSTANDING OF GROWTH AND GRAVITROPISM Abstract Only

Mordecai J. Jaffe and Hileyuki Takashi *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 82-83 (For primary document see N85-26054 15-51)

Avail: NTIS HC A07/MF A01 CSCL 06C

One mutant of Pism sativum CREEP grows normally up to the first internode stage, and then begins to grow plagiotropically. The upper internodes bend slowly downward according to a programmed sequence which follows circumnutation of the previous internode and opening of the previous leaves, but preceeds expansion of the previous leaves. The bending is partially inhibited by excission of the opposing stipules. The second mutant, AGEOTROPUM is gravitropically incompetant when grown etiolated, in the dark. When etiolated plants are illuminated with white light, the stems become gravitropically competant, but the roots do not. If the plants are grown in the light in particulate medium, some secondary roots, growing randomly, emerge into the air, and turn and grow downward toward moist soil. When etiolated AGEOTROPUM plants are illuminated, the shoots then become able to respond to gravity in a normal, negatively orthogravitropic manner. The response is to red light and is reversed by far red light. The mutation may involve one or more of the following: (1) release of sequestered calcium for redistribution; (2) radial transport of released calcium; or (3) net calcium flux in the upward direction. A.R.H.

N85-26089*# Pennsylvania State Univ., University Park. Dept. of Biology.

PLANT GROWTH BIOPHYSICS: THE BASIS FOR GROWTH ASYMMETRY INDUCED BY GRAVITY Abstract Only

Daniel Cosgrove *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 84 (For primary document see N85-26054 15-51)

(Grant NAGw-480)

Avail: NTIS HC A07/MF A01 CSCL 06C

The identification and quantification of the physical properties altered by gravity when plant stems grow upward was studied. Growth of the stem in vertical and horizontal positions was recorded by time lapse photography. A computer program that uses a cubic spline fitting algorithm was used to calculate the growth rate and curvature of the stem as a function of time. Plant stems were tested to ascertain whether cell osmotic pressure was altered by gravity. A technique for measuring the yielding properties of the cell wall was developed. E.R.

N85-26090*# .Ohio State Univ., Columbus. Dept. of Biology.

AN INDIRECT ROLE FOR ETHYLENE IN SHOOT-INVERSION RELEASE OF APICAL DOMINANCE IN PHARBITIS NIL Abstract Only

Morris G. Cline *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 85-86 (For primary document see N85-26054 15-51)

(Grant NsG-625)

Avail: NTIS HC A07/MF A01 CSCL 06C

Evidence is presented which indicated that ethylene does not play a direct role in promoting or inhibiting bud outgrowth as a gravity response. It is concluded that the treatment of inactive or induced lateral buds with ethylene inhibitors or ethrel has no significant effect on bud outgrowth and that no changes occur in ethylene emanation in the Highest Lateral Bud (HLB) or HLB node following shoot inversion. Possible mechanisms by which ethylene released by shoot inversion may indirectly promote outgrowth of the HLB is presented. E.R.

N85-26091*# Michigan Univ., Ann Arbor. Dept. of Cellular and Molecular Biology.

GRAVITY PERCEPTION AND RESPONSE IN SHOOT OF CEREAL GRASSES Abstract Only

Peter B. Kaufman, Il Song, and Cherie Bluncson *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 87-88 (For primary document see N85-26054 15-51)

(Grant NAGw-34)

Avail: NTIS HC A07/MF A01 CSCL 06C

Two components of the gravitropic curvature response in cereal grass pulvini are studied. These two components are gravity perception and mechanism of response following the transduction phase. The effects of gravity, time lag, protein synthesis and enzyme production are included. E.R.

N85-26092*# Indiana Univ., Bloomington. Dept. of Biology.

SIMULATED MICROGRAVITY AS A PROBE FOR UNDERSTANDING THE MECHANISMS OF EARLY PATTERN SPECIFICATION Abstract Only

A. W. Neff and George M. Malacinski *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 91 (For primary document see N85-26054 15-51)

(Grant NAGw-60)

Avail: NTIS HC A07/MF A01 CSCL 06C

Early pattern specification (e.g., axial structure morphogenesis, doreal ventral polarity, etc.) is monitored in amphibian eggs which were subjected to microgravity simulation by constant rotation on a horizontal clinostat. In contrast to previous clinostat experiments, rotation is initiated either prior to fertilization or immediately thereafter. Large proportions of clinostated eggs developed normal axial structures. A model which employs a multiple set of signals for specifying early pattern is discussed. Effects of microgravity simulation on the earliest post fertilization pattern specification event dorsal/ventral polarization is analyzed in detail. Other models are developed and they are discussed. As a general mechanism for explaining the manner in which regional developmental patterns emerge from the initial, radially symmetrial egg, the density compartment model is described. The identification of the various zones or compartments of egg cytoplasm using inverted eggs is explained. Author

N85-26093*# Arizona Univ., Tucson. Dept. of Physiology.

DEVELOPMENT AND MATURATION OF THE NEUROMUSCULAR JUNCITON IN CELL CULTURE UNDER CONDITIONS OF SIMULATED ZERO-GRAVITY Abstract Only

Raphael Gruener *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 92-93 (For primary document see N85-26054 15-51)

(Grant NAGw-539)

Avail: NTIS HC A07/MF A01 CSCL 06C

Alterations in gravitational conditions which alter the normal development and interactions of nerve and muscle cells grown in culture is examined. Clinostat conditions, similating Og, which produce changes in cell morphology and growth patterns is studied. Data show that rotation of cocultures of nerve and muscle cells results in morphologic changes which are predicted to significantly alter the functional interactions between the elements of a prototypic synapse. It is further predicted that similar alterations

may occur in central synapses which may therefore affect the development of the central nervous system when subjected to altered gravitational conditions. E.R.

N85-26094*# Columbia Univ., New York. Dept. of Human Genetics and Development.
EFFECTS OF SIMULATED WEIGHTLESSNESS ON MAMMALIAN DEVELOPMENT. PART 2: MEIOTIC MATURATION OF MOUSE OOCYTES DURING CLINOSTAT ROTATION Abstract Only
Debra J. Wolgemuth and George S. Grills *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 94-95 refs (For primary document see N85-26054 15-51)
(Grant NAGw-346)
Avail: NTIS HC A07/MF A01 CSCL 06C

In order to understand the role of gravity in basic cellular processes that are important during development, the effects of a simulated microgravity environment on mammalian gametes and early embryos cultured in vitro are examined. A microgravity environment is simulated by use of a clinostat, which essentially reorients cells relative to the gravity vector. Initial studies have focused on assessing the effects of clinostat rotation on the meiotic progression of mouse oocytes. Modifications centered on providing the unique in vitro culture of the clinostat requirements of mammalian oocytes and embryos: 37 C temperature, constant humidity, and a 5% CO2 in air environment. The oocytes are observed under the dissecting microscope for polar body formation and gross morphological appearance. They are then processed for cytogenetic analysis. E.R.

N85-26095*# Texas Univ., Houston. Inst. of Dental Science.
EFFECTS ON IN VIVO AND IN VITRO EXPOSURE TO EXCESS GRAVITY ON GROWTH AND DIFFERENTIATION OF MAMMALIAN EMBRYOS Abstract Only
Jackie Duke *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 96-97 refs (For primary document see N85-26054 15-51)
(Grant NAGw-438)
Avail: NTIS HC A07/MF A01 CSCL 06C

Studies on the development of embryonic mouse tissues exposed to excess gravity in vitro and in vivo are discussed. Suppression is seen in limb buds cultured under 3G. Mouse palates were exposed to excess G in vitro, 13- and 14-day palates were exposed to 2.6G for 24 hours. For in vivo studies, a small animal centrifuge was constructed. When the centrifuge is operated at 40 and 45 rpm, the linear accelerations generated range from 1.8 to 3.5G. The effects of gravity on body weights and on reproduction is also presented. E.R.

N85-26096*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Developmental Genetics and Anatomy.
CELL DEATH, NEURONAL PLASTICITY AND FUNCTIONAL LOADING IN THE DEVELOPMENT OF THE CENTRAL NERVOUS SYSTEM Abstract Only
J. Richard Keefe *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 98-99 refs (For primary document see N85-26054 15-51)
Avail: NTIS HC A07/MF A01 CSCL 06C

Research on the precise timing and regulation of neuron production and maturation in the vestibular and visual systems of Wistar rats and several inbred strains of mice (C57B16 and Pallid mutant) concentrated upon establishing a timing baseline for mitotic development of the neurons of the vestibular nuclei and the peripheral vestibular sensory structures (maculae, cristae). This involved studies of the timing and site of neuronal cell birth and preliminary studies of neuronal cell death in both central and peripheral elements of the mammalian vestibular system. Studies on neuronal generation and maturation in the retina were recently added to provide a mechanism for more properly defining the in utero' developmental age of the individual fetal subject and to closely monitor potential transplacental effects of environmentally stressed maternal systems. Information is given on current efforts concentrating upon the (1) perinatal period of development (E18 thru P14) and (2) the role of cell death in response to variation in the functional loading of the vestibular and proprioreceptive systems in developing mammalian organisms. R.J.F.

N85-26097*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GRAVITATIONAL EFFECTS ON REPRODUCTION, GROWTH AND DEVELOPMENT OF MAMMALS Abstract Only
Jiro Oyama *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 100 (For primary document see N85-26054 15-51)
Avail: NTIS HC A07/MF A01 CSCL 06C

The broad objective of this research program is to determine the role which gravity plays in the growth and development of mammalian animals. Current studies are focused on the effects of graded hypergravitatinal field intensities on mice, rats and other small sized laboratory animals using the chronic centrifugation technique. They include studies on reproduction and prenatal and postnatel growth and development. Among the important questions addressed are: (1) what stage or stages in animal development are affected by hypergravity and what are the effects? (2) is there a minimum or critical body size for hypergravity to produce a significant effect on growth and development? (3) are there field intensity thresholds for the preceding questions? From analysis of the body masses at birth of rats conceived and allowed to undergo gestation under 2.1G and under normal gravity (1G), it was found that there was no significant difference between the two groups. Futhermore, their growth rates postnatally were the same until they reached a body mass of approximately 50 grams when the 2.1G group showed a significantly slower rate. Results from these studies support the conclusion that prenatal as well as the early postnatal stages of growth and development of the rat are refractory to hyper-G. Author

N85-26098*# Washington Univ., St. Louis, Mo. Dept. of Pathology.
EVIDENCE THAT RESORPTION OF BONE BY RAT PERITONAL MACROPHAGES OCCURS IN AN ACIDIC ENVIRONMENT Abstract Only
Harry C. Blair *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 103 (For primary document see N85-26054 15-51)
Avail: NTIS HC A07/MF A01 CSCL 06C

Skeletal loss in space, like any form of osteoporosis, reflects a relative imbalance of the activities of cells resorbing (degrading) or forming bone. Consequently, prevention of weightlessness induced bone loss may theoretically be accomplished by (1) stimulating bone formation or (2) inhibiting bone resorption. This approach, however, requires fundamental understanding of the mechanisms by which cells form or degrade bone, information not yet at hand. An issue central to bone resorption is the pH at which resorption takes place. The pH dependent spectral shift of a fluorescent dye (fluorescein isothiocyanate) conjugated to bone matrix was used to determine the pH at the resorptive cell bone matrix interface. Devitalized rat bone was used as the substrate, and rat peritoneal macrophages were used as the bone resorbing cells. The results suggest that bone resorption is the result of generation of an acidic microenvironment at the cell matrix junction. R.J.F.

N85-26099*# Stanford Univ., Calif. Dept. of Biological Sciences.
CIRCADIAN RHYTHM CONTROL: NEUROPHYSIOLOGICAL INVESTIGATIONS Abstract Only
Steven F. Glotzbach *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 104 (For primary document see N85-26054 15-51)
Avail: NTIS HC A07/MF A01 CSCL 06C

The suprachiasmatic nucleus (SCN) was implicated as a primary component in central nervous system mechanisms governing circadian rhythms. Disruption of the normal synchronization of temperature, activity, and other rhythms is detrimental to health. Sleep wake disorders, decreases in vigilance and performance, and certain affective disorders may result from or be exacerbated by such desynchronization. To study the basic neurophysiological mechanisms involved in entrainment of circadian systems by the

environment, Parylene-coated, etched microwire electrode bundles were used to record extracellular action potentials from the small somata of the SCN and neighboring hypothalamic nuclei in unanesthetized, behaving animals. Male Wistar rats were anesthetized and chronically prepared with EEG ane EMG electrodes in addition to a moveable microdrive assembly. The majority of cells had firing rates < 10 Hz and distinct populations of cells which had either the highest firing rate or lowest firing rate during sleep were seen. R.J.F.

N85-26100*# Louisville Univ., Ky. Dept. of Microbiology and Immunology.

THE EFFECTS OF SIMULATED WEIGHTLESSNESS ON SUSCEPTIBILITY TO VIRAL AND BACTERIAL INFECTIONS USING A MURINE MODEL Abstract Only

Cheryl L. Gould *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 105 (For primary document see N85-26054 15-51)
Avail: NTIS HC A07/MF A01 CSCL 06C

Certain immunological responses may be compromised as a result of changes in environmental conditions, such as the physiological adaptation to and from the weightlessness which occurs during space flight and recovery. A murine antiorthostatic model was developed to simulate weightlessness. Using this model, the proposed study will determine if differences in susceptibility to viral and bacterial infections exist among mice suspended in an antiorthostatic orientation to simulate weightlessness, mice suspended in an orthostatic orientation to provide a stressful situation without the condition of weightlessness simulation, and non-suspended control mice. Inbred mouse strains which are resistant to the diabetogenic effects of the D variant of encephalomyocarditis virus (EMC-D) and the lethal effects of Salmonella typhimurium will be evaluated. Glucose tolerance tests will be performed on all EMC-D-infected and non-infected control groups. The incidence of EMC-D-induced diabetes and the percentage survival of S. typhimurium-infected animals will be determined in each group. An additional study will determine the effects of simulated weightlessness on murine responses to exogenous interferon. M.G.

N85-26101*# Washington Univ., St. Louis, Mo. Dept. of Biology.

PARTICIPATION OF ETHYLENE IN TWO MODES OF GRAVISTIMULATION OF SHOOTS Abstract Only

Marcia Harrison *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 106 (For primary document see N85-26054 15-51)
Avail: NTIS HC A07/MF A01 CSCL 06C

In order to elucidate the role of ehtylene in gravitropism, detailed time courses for ethylene production in horizontal and upright plants were measured. Tomato and pea were chosen as examples of plants which exhibit different patterns of gravitropic curvature. Tomato seedlings were placed in gas-tight lucite boxes from which air was sampled and analyzed for ethylene. During the first 2 min interval after one set of plants was turned horizontal ethylene production was double the baseline. Similarly, plants rotated 3 rpm about a vertical axis transiently doubled ethylene production when the axis was shifted 90 deg. In order to clarify the role of this 2-min burst, the effect of exogenous ethylene was studied. In peas, epicotyls were excised, equilibrated until wound ethylene had subsided to a low stable level, and ethylene production was measured in vertical and horizontal segments. As for tomatoes, excised pea epicotyls increased their rate of ethylene production during the first 2 min of gravistimulation. Also, very low concentrations of exogenous ethylene slightly enhance curvature. On the other hand, higher levels of ethylene and 1-aminocyclopropane-1-carboxylic acid (ACC) inhibit overall curvature. M.G.

N85-26102*# Wayne State Univ., Detroit, Mich. Dept. of Otolaryngology and Biochemistry.

QUANTITATION OF Na+, K+-ATPASE ENZYME ACTIVITY IN TISSUES OF THE MAMMALIAN VESTIBULAR SYSTEM Astract Only

Thomas P. Kerr *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 107-108 (For primary document see N85-26054 15-51)
Avail: NTIS HC A07/MF A01 CSCL 06C

In order to quantify vestibular Na(+), K(+)-ATPase, a microassay technique was developed which is sufficiently sensitive to measure the enzymatic activity in tissue from a single animal. The assay was used to characterize ATPase in he vestibular apparatus of the Mongolian gerbil. The quantitative procedure employs NPP (5 mM) as synthetic enzyme substrate. The assay relies upon spectrophotometric measurement (410 nm) of nitrophenol (NP) released by enzymatic hydrolysis of the substrate. Product formation in the absence of ouabain reflects both specific (Na(+), K(+)-ATPase) and non-specific (Mg(++)-ATPase) enzymatic activity. By measuring the accumulation of reaction product (NP) at three-minute intervals during the course of incubation, it is found that the overall enzymatic reaction proceeds linearly for at least 45 minutes. It is therefore possible to determine two separate reaction rates from a single set of tissues. Initial results indicate that total activity amounts to 53.3 + or - 11.2 (S.E.M.) nmol/hr/mg dry tissue, of which approximately 20% is ouabain-sensitive. M.G.

N85-26103*# Stanford Univ., Calif. Dept. of Biological Sciences.

ISOLATION OF HYBRIDOMAS FOR GOLGI-ASSOCIATED PROTEINS AND A PLANT CALMODULIN Abstract Only

Konrad M. Kuzmanoff and Peter M. Ray *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 109 refs (For primary document see N85-26054 15-51)
Avail: NTIS HC A07/MF A01 CSCL 06C

The demonstration of a role for calcium in the mechanism of the gravitropic response indicates a role for calmodulin. Localization studies indicate that plant cell walls have a high content of calmodulin which suggests a regulatory role for CaM in both gravitropic curvature and auxin-induced growth. Auxin regulation of cell wall loosening and elongation is the basis for most models of this phenomenon. Auxin treatment of pea stem tissue rapidly increases the ctivity of Golgi-localized B-1,4-glucan synthase (GS), an enzyme involved in biosynthesis of wall xyloglucan which apparently constitutes the substrate for the wall loosening process. In order to determine whether auxin stimulates GS activity either by modulation of existing enzyme or induces de novo formation of Golgi glucan synthase, a study was undertaken to isolate and quantitate glucan synthase. This enzyme appears to be an integral protein of the Golgi membrane and has resisted isolation with retention of activity. The production of monoclonal antibody for glucan synthase was undertaken due to the inability to isolate GS by standard detergent/liposome techniques. M.G.

N85-26104*# Pittsburgh Univ., Pa. Dept. of Physiology.

SENSORY AND MOTOR PROPERTIES OF THE CEREBELLAR UVULA AND MODULUS Abstract Only

Farrel R. Robinson *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 110 (For primary document see N85-26054 15-51)
Avail: NTIS HC A07/MF A01 CSCL 06C

The uvula and nodulus (vermal lobules 9 and 10) of the vestibulocerebellum are implicated by behavioral evidence in the control of eye and head movements and in the production of motion sickness. The uvula and nodulus could play a role in these functions through known output pathways. Purkinje cells in both structures project via the fastigial and vestibular nuceli to the ventral horn of the cervical spin cord, to oculomotor neurons, and to the emetic region of the reticular formation (ablation of which abolishes susceptability to motion sickness). Uvula and nodulus Purkinje cells will be analyzed in cats trained to make controlled head movements. The activity of these neurons is expected to modulate well during head and/or eye movements because the uvula and nodulus receive heavy projections from sources of visual, vestibular and neck proprioceptive information. How neuron activity contributes to movement and how different sensory inputs converge to influence this contribution may be determined by characterizing movement related properties of these neurons. A population of neurons that modulates powerfully to the conflict between different

head movement signals that can cause motion sickness may be identified. M.G.

N85-26105*# Texas Univ., Austin.
DIFFERENTIAL WALL GROWTH IN GRAVISTIMULATED CORN ROOTS: ITS TIMING AND REGULATION Abstract Only
Bruce S. Serlin *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 111 (For primary document see N85-26054 15-51)
Avail: NTIS HC A07/MF A01 CSCL 06C

The experiments designed to document cell-wall level changes which occur as a result of their gravistimulation are described. The goal of this research is to elucidate the mechanism and time frame of differential growth following a controlled gravistimulation. To achieve this, rates of wall deposition will be determined by following the incorporation of radioactive monosaccharides into the wall. Complementing this experiment will be a freeze-etch study directed at revealing the spatial arrangment of both newly-deposited microfibrils and microfibrils that were present in the growing root prior to stimulation. The second phase of the proposed research will examine the roles ethylene and Ca(2+) have in the modulation of differential wall changes during gravitropism. Ethylene and Ca(2+) have both been implicated as regulators of the gravitropic response in roots and they have also been implicated as regulators of the gravitropic response in roots and they have also been reported to exert some control on the orientation of microfibrils. Both of these agents will be manipulated in such a way as to reveal whether they have a direct influence on cell wall deposition and microfibrillar alignment during the geotropic response. M.G.

N85-26106*# California Univ., Irvine. Dept. of Anatomy and Surgery.
ANATOMY OF THE VESTIBULO-AUTOMATIC OUTFLOW TO THE GUT Abstract Only
Yasuhiro Torigoe *In* NASA. Washington NASA Space Biol. Program: Apr. 1985 p 112-113 (For primary document see N85-26054 15-51)
Avail: NTIS HC A07/MF A01 CSCL 06C

Motion sickness can be induced by vestibular effects on the sympathetic portion of the autonomic nervous system. However, the pathways linking the vestibular and autonomic pathways are unknown. As a first step in this analysis, the locations of preganglionic sympathetic neurons (PSN) and dorsal root afferent ganglionic neurons (DRG) which supply sympathetic innervation to major portions of the gastrointestinal tract in rabbits were identified. The objective of a second series of experiments is to determine which of the brainstem nuclei project to the autonomic regions of the spinal cord that control gastrointestinal motility. To achieve this goal, a trans-synaptic retrograde tracer (3H-tetanus toxoid) is applied to the greater splanchnic nerve. This method allows the labeling of neurons within the brainstem that project only to the preganglionic synpathetic neurons. One structure that has been strongly implicated in mediating vestibulo-autonomic control is the cerebellum (i.e., nodulus and uvula). The outflow of these lobules to the autonomic regions of the brainstem is mediated by the fastigial nucleus. To determine the precise projections of the fastigial nucleus to the brainstem nuclei involved in emesis, anterograde tracer (3H-leucine) was injected into the fastigial nucleus in a third series of experiments. M.G.

N85-26107*# Management and Technical Services Co., Houston, Tex. Biomedical Research Div.
A DETAILED ANALYSIS OF THE ERYTHROPOIETIC CONTROL SYSTEM IN THE HUMAN, SQUIRREL, MONKEY, RAT AND MOUSE
Alan W. Nordheim May 1985 94 p refs
(Contract NAS9-17151)
(NASA-CR-171879; NAS 1.26:171879; TIR-2114-MED-5010) Avail: NTIS HC A05/MF A01 CSCL 06C

The erythropoiesis modeling performed in support of the Body Fluid and Blood Volume Regulation tasks is described. The mathematical formulation of the species independent model, the solutions to the steady state and dynamic versions of the model, and the individual species specific models for the human, squirrel monkey, rat and mouse are outlined. A detailed sensitivity analysis of the species independent model response to parameter changes and how those responses change from species to species is presented. The species to species response to a series of simulated stresses directly related to blood volume regulation during space flight is analyzed. E.A.K.

N85-26108*# Vanderbilt Univ., Nashville, Tenn. Dept. of Pharmacology.
IS FAST FIBER INNERVATION RESPONSIBLE FOR INCREASED ACETYLCHOLINESTERASE ACTIVITY IN REINNERVATING SOLEUS MUSCLES?
Karl E. Misulis and Wolf-D. Dettbarn [1985] 19 p refs
(Grants NAG2-301; NAGw-469)
(NASA-CR-175716; NAS 1.26:175716) Avail: NTIS HC A02/MF A01 CSCL 06C

An investigation was conducted as to whether the predominantly slow SOL, which is low in AChE activity, is initially reinnervated by axons that originally innervated fast muscle fibers with high AChE activity, such as those of the EDL. Local denervation of the SOL in the guinea pig was performed because this muscle is composed solely of slow (type I) fibers; thereby virtually eliminating the possibility of homologous muscle fast fiber innervation. The overshoot in this preparation was qualitatively similar to that seen with distal denervation in the guinea pig and local and distal denervation in the rat. Thus, initial fast fiber innvervation is not responsible for the patterns of change in AChE activity seen with reinnervation in the SOL. It is concluded that the neural control of AChe is different in these two muscles and may reflect specific differences in the characteristics of AChE regulation in fast and slow muscle. Author

N85-26109*# Vanderbilt Univ., Nashville, Tenn. Dept. of Pharmacology.
USE AND DISUSE AND THE CONTROL OF ACETYLCHOLINESTERASE ACTIVITY IN FAST AND SLOW TWITCH MUSCLE OF RAT
Wolf-D. Dettbarn, D. Groswald, R. C. Gupta, and K. E. Misulis [1985] 22 p refs
(Grant NAG2-301)
(NASA-CR-175717; NAS 1.26:175717) Avail: NTIS HC A02/MF A01 CSCL 06C

The role of acetylcholinesterase (AChE) in neuromuscular transmission is relatively well established, little is known, however, of the mechanisms that regulate its synthesis and control its specific distribution in fast and slow muscle. Innervation plays an important role in the regulation of AChE and elimination of the influence of the nerve by surgical denervation results in a loss of AChE. The influences of the nerve and how they are mediated was investigated. It is suggested that muscle usage and other factors such as materials carried by axonal transport may participate in the regulation of this enzyme. The mechanisms that regulate AChE and its molecular forms in two functionally different forms are studied. E.A.K.

N85-26110*# Vanderbilt Univ., Nashville, Tenn. Dept. of Pediatrics.
DIFFERENTIAL EFFECT OF DENERVATION ON FREE RADICAL SCAVENGING ENZYMES IN SLOW AND FAST MUSCLE OF RAT
Kohtaro Asayama, Wolf-D. Dettbarn, and Ian M. Burr [1985] 22 p refs
(Grant NAG2-301)
(NASA-CR-175719; NAS 1.26:175719) Avail: NTIS HC A02/MF A01 CSCL 06C

To determine the effect of denervation on the free radical scavenging systems in relation to the mitochondrial oxidative metabolism in the slow twitch soleus and fast twitch extensor digitorum longus (EDL) muscles, the sciatic nerve of the rat was crushed in the mid-thigh region and the muscle tissue levels of 5 enzymes were studied 2 and 5 weeks following crush. Radioimmunoassays were utilized for the selective measurement of cuprozinc

(cytosolic) and mangano (mitochondrial) superoxide dismutases. These data represent the first systematic report of free radical scavening systems in slow and fast muscles in response to denervation. Selective modification of cuprozinc and manganosuperoxide dismutases and differential regulation of GSH-peroxidase was demonstrated in slow and fast muscle. B.G.

N85-26111*# Vanderbilt Univ., Nashville, Tenn. Dept. of Pharmacology.
CHANGES IN THE CHOLINERGIC SYSTEM OF RAT SCIATIC NERVE AND SKELETAL MUSCLE FOLLOWING SUSPENSION INDUCED DISUSE
Ramesh C. Gupta, Karl E. Misulis, and Wolf-D. Dettbarn 1984 21 p refs Presented at the 68th Ann. Meeting of Federation of American Societies for Experimental Biology, St. Louis, 1-6 Apr. 1984
(Grant NAGw-469)
(NASA-CR-175718; NAS 1.26:175718) Avail: NTIS HC A02/MMF A01 CSCL 06C

Muscle disused induced changes in the cholinergic system of sciatic nerve, slow twitch soleus (SOL) and fast twitch extensor digitorum longus (EDL) muscle were studied in rats. Rats with hindlimbs suspended for 2 to 3 weeks showed marked elevation in the activity of choline acetyltransferase (ChAT) in sciatic nerve (38%), in SOL (108%) and in EDL (67%). Acetylcholinesterase (AChE) activity in SOL increased by 163% without changing the molecular forms pattern of 4S, 10S, 12S, and 16S. No significant changes in activity and molecular forms pattern of AChE were seen in EDL or in AChE activity of sciatic nerve. Nicotinic receptor binding of 3H-acetylcholine was increased in both muscles. When measured after 3 weeks of hindlimb suspension the normal distribution of type 1 fibers in SOL was reduced and a corresponding increase in type IIa and IIb fibers is seen. In EDL no significant change in fiber proportion is observed. Muscle activity, such as loadbearing, appears to have a greater controlling influence on the characteristics of the slow twitch SOL muscle than upon the fast twitch EDL muscle. E.A.K.

N85-26112# Washington Univ., Seattle. Bioelectromagnetics Research Lab.
EFFECTS OF LONG-TERM LOW-LEVEL RADIOFREQUENCY RADIATION EXPOSURE ON RATS. VOLUME 7: METABOLISM, GROWTH AND DEVELOPMENT Final Reprot
Robert B. Johnson, Lawrence L. Kunz, Desmond Thompson, John Crowley, Chung-Kwang Chou, and Arthur W. Guy Sep. 1984 100 p refs
(Contract F33615-80-C-0612)
(AD-A150829; USAFSAM-TR-84-31-Vol-7) Avail: NTIS HC A05/MF A01 CSCL 06/18

For 25 months 100 male specific pathogen-free (SPF) rats were exposed to pulsed 2450-MHz circularly polarized microwaves at an average power density of 0.480 mW/sq. cm; 100 rats served as sham-exposed controls. Analysis of daily body weight and food and water consumption failed to distinguish the treatment groups. Periodic assessment of oxygen consumption, carbon dioxide production, and respiratory quotient also failed to reliably differentiate the groups. Whole-body carcass analysis, including organ mass, fatty acid profile, and mineral content were conducted on 20 rats killed after 13 months exposure and 20 killed at termination. With one exception, these measures did not indicate significant differences between the treatment groups. No consistant significant effects were observed. Author

N85-26113# National Science Foundation, Washington, D.C.
BIOTECHNOLOGY IN JAPAN
H. W. Lewis 15 Jun. 1984 91 p refs
(PB85-169464) Avail: NTIS HC A05/MF A01 CSCL 06E

Japan's special thrust in biotechnology started in 1981 with a report issued by the Ministry of International Trade and Industry (MITI), outlining a 10-year program. The present report is an assessment of the first 2 years of that program. The report is presented in two major parts: (1) the organization of the biotechnology enterprise and an assessment of its infrastructure, and (2) a survey of accomplishments. GRA

N85-25326# Joint Publications Research Service, Arlington, Va.
SECOND SOVIET-FRENCH SYMPOSIUM ON SPACE TECHNOLOGY
V. P. Ovcharov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 46 Transl. into ENGLISH from Sov. Estoniya (USSR), 1 Dec. 1984 p 3 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25327# Joint Publications Research Service, Arlington, Va.
PLASMODIUM OF MYXOMYCETE AS RESEARCH OBJECT IN GRAVITATIONAL BIOLOGY Abstract Only
M. G. Tairbekov, S. I. Beylina, D. B. Layrand, A. A. Budnitskiy, and V. V. Lednev *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 48 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Biologicheskaya (USSR), no. 2, Mar.-Apr. 1984 p 48 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N85-26114* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Apr. 1985 116 p
(NASA-SP-7011(270); NAS 1.21:7011(270)) Avail: NTIS HC A06 CSCL 06E

This bibliography lists 417 reports, articles and other documents introduced into the NASA scientific and technical information system in March 1985. M.G.

N85-26115*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TEST AND EVALUATION OF THE 2.4-MICRON PHOTOREFRACTOR OCULAR SCREENING SYSTEM
John R. Richardson Feb. 1985 42 p refs
(NASA-TM-86492; NAS 1.15:86492) Avail: NTIS HC A03/MF A01 CSCL 06E

An improved 2.4-m photorefractor ocular screening system was tested and evaluated. The photorefractor system works on the principal of obtaining a colored photograph of both human eyes; and, by analysis of the retinal reflex images, certain ocular defects can be detected such a refractive error, strabismus, and lens obstructions. The 2.4-m photorefractory system uses a 35-mm camera with a telephoto lens and an electronic flash attachment. Retinal reflex images obtained from the new 2.4-m system are significantly improved over earlier systems in image quality. Other features were also improved, notably portability and reduction in mass. A total of 706 school age children were photorefracted, 211 learning disabled and 495 middle school students. The total students having abnormal retinal reflexes were 156 or 22 percent, and 133 or 85 percent of the abnormal had refractive error indicated. Ophthalmological examination was performed on 60 of these students and refractive error was verified in 57 or 95 percent of those examined. The new 2.4-m system has a NASA patent pending and is authorized by the FDA. It provides a reliable means of rapidly screening the eyes of children and young adults for vision problems. It is especially useful for infants and other non-communicative children who cannot be screened by the more conventional methods such as the familiar E chart. Author

N85-26116*# National Aeronautics and Space Administration, Washington, D. C.
SEVERAL SPECIFIC AND NONSPECIFIC RESPONSES OF THE HUMAN AND ANIMAL BODY TO SHIP NOISE

S. S. Markaryan, S. S. Volkov, and A. B. Sysoyev May 1983 9 p refs Transl. into ENGLISH from Vestn. Otorinolaringol. (USSR), Mar. - Apr. 1983 p 8-11 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Scientific Research Inst. of Hygiene and Water Transportation, Ministry of Health (USSR)
(Contract NASw-3541)
(NASA-TM-77483; NAS 1.15:77483) Avail: NTIS HC A02/MF A01 CSCL 06S

The effect of noise on cargo boats on a long voyage differs considerably from the effect of noise in factories and in service industries. The peculiarities of the effect of round-the-clock noises at sea at 55 to 85 decibels, typical for cargo boats, were studied in white rats in the laboratory and aboard ship (each of the experiments lasted three months) and in young naval cadets and experienced seamen on voyages lasting one, two, and three months. The findings helped to derive health standards for maximum admissible noise level at sea. Author

N85-26117*# Management and Technical Services Co., Houston, Tex.
COMPUTER SIMULATION STUDIES IN FLUID AND CALCIUM REGULATION AND ORTHOSTATIC INTOLERANCE Final Report
7 May 1985 110 p refs
(Contract NAS9-17151)
(NASA-CR-171869; NAS 1.26:171869; TIR-2114-MED-5015; DLR-T-1825; DRD-MA945T) Avail: NTIS HC A06/MF A01 CSCL 06P

The systems analysis approach to physiological research uses mathematical models and computer simulation. Major areas of concern during prolonged space flight discussed include fluid and blood volume regulation; cardiovascular response during shuttle reentry; countermeasures for orthostatic intolerance; and calcium regulation and bone atrophy. Potential contributions of physiologic math models to future flight experiments are examined. A.R.H.

N85-26118*# Management and Technical Services Co., Houston, Tex.
ANALYSIS OF HEAD-DOWN TILT AS AN ANALOG OF WEIGHTLESSNESS USING A MATHEMATICAL SIMULATION MODEL
Joel I. Leonard 4 Sep. 1984 86 p refs
(Contracts NAS9-15487; NAS9-16328; NAS9-15850; NAS9-17151)
(NASA-CR-171870; NAS 1.26:171870; TIR-2114-MED-4003) Avail: NTIS HC A05/MF A01 CSCL 06S

Antiorthostasis or head down tilt of a moderate degree was used as a ground based analog of weightless space flight to study headward fluid shifts, decreased plasma volume, orthostatic intolerance and muscular skeletal degradation. A mathematical model was used to help interpret these observations. The model proved most valuable for these studies was originally developed as a description of the major circulatory, fluid and electrolyte control systems. Two different experimental studies are employed to validate the model. The first is a 24 hour head down tilt study and the second is a 7 day head down bed rest study. The major issues addressed include the reduction in plasma volume, the dynamic changes of venous pressure and cardiac output, the extent of central hypervolemia during long term zero g exposure, the existence of an early diuresis, the mechanisms which alter the renal regulating hormones during the short term and long term periods, the significance of potassium loss on other zero g responses, and the role of transcapillary filtration in adjusting fluid shifts. The use of mathematical models as an interpretive and analysis technique for experimental research for space life science is illustrated. E.A.K.

N85-26119*# Management and Technical Services Co., Houston, Tex.
PREDICTIONS OF CARDIOVASCULAR RESPONSES DURING STS REENTRY USING MATHEMATICAL MODELS
Joel I. Leonard and R. Srinivasan 4 Sep. 1985 36 p refs
(Contract NAS9-17151)
(NASA-CR-171871; NAS 1.26:171871; TIR-2114-MED-4002) Avail: NTIS HC A03/MF A01 CSCL 06S

The physiological adaptation to weightless exposure includes cardiovascular deconditioning arising in part from a loss of total circulating blood volume and resulting in a reduction of orthostatic tolerance. The crew of the Shuttle orbiter are less tolerant to acceleration forces in the head-to-foot direction during the reentry phase of the flight at a time they must function at a high level of performance. The factors that contribute to orthostatic intolerance during and following reentry and to predict the likelihood of impaired crew performance are evaluated. A computer simulation approach employing a mathematical model of the cardiovascular system is employed. It is shown that depending on the severity of blood volume loss, the reentry acceleration stress may be detrimental to physiologic function and may place the physiologic status of the crew near the borderline of some type of impairment. They are in agreement with conclusions from early ground-based experiments and from observations of early Shuttle flights. E.A.K.

N85-26120*# Management and Technical Services Co., Houston, Tex.
SIMULATION OF A G-TOLERANCE CURVE USING THE PULSATILE CARDIOVASCULAR MODEL
M. Solomon and R. Srinivasan 31 Jan. 1985 19 p refs
(Contract NAS9-17151)
(NASA-CR-171873; NAS 1.26:171873; TIR-2114-MED-4007) Avail: NTIS HC A02/MF A01 CSCL 06S

A computer simulation study, performed to assess the ability of the cardiovascular model to reproduce the G tolerance curve (G level versus tolerance time) is reported. A composite strength duration curve derived from experimental data obtained in human centrifugation studies was used for comparison. The effects of abolishing autonomic control and of blood volume loss on G tolerance were also simulated. The results provide additional validation of the model. The need for the presence of autonomic reflexes even at low levels of G is pointed out. The low margin of safety with a loss of blood volume indicated by the simulation results underscores the necessity for protective measures during Shuttle reentry. E.A.K.

N85-26121*# Management and Technical Services Co., Houston, Tex.
AKTERATIONS/CORRECTIONS TO THE BRASS PROGRAM
Susan N. Brand 8 Apr. 1985 2 p
(Contract NAS9-17151)
(NASA-CR-171874; NAS 1.26:171874; TIR-2114-MED-5007) Avail: NTIS HC A02/MF A01 CSCL 06S

Corrections applied to statistical programs contained in two subroutines of the Bed Rest Analysis Software System (BRASS) are summarized. Two subroutines independently calculate significant values within the BRASS program. R.J.F.

N85-26122*# Management and Technical Services Co., Houston, Tex.
DESCRIPTION, VALIDATION, AND MODIFICATION OF THE GUYTON MODEL FOR SPACE-FLIGHT APPLICATIONS. PART A. GUYTON MODEL OF CIRCULATORY, FLUID AND ELECTROLYTE CONTROL. PART B. MODIFICATION OF THE GUYTON MODEL FOR CIRCULATORY, FLUID AND ELECTROLYTE CONTROL
Joel I. Leonard 1985 27 p refs
(Contract NAS9-17151)
(NASA-CR-171876; NAS 1.26:171876; TIR-2114-MED-5006) Avail: NTIS HC A03/MF A01 CSCL 06P

The mathematical model that has been a cornerstone for the systems analysis of space-flight physiological studies is the Guyton model describing circulatory, fluid and electrolyte regulation. The model and the modifications that are made to permit simulation and analysis of the stress of weightlessness are described. E.A.K.

N85-26123*# Management and Technical Services Co., Houston, Tex.
THE BEHAVIOR OF RENAL-REGULATING HORMONES DURING

HYPOGRAVIC STRESS
Joel I. Leonard 1985 62 p refs
(Contracts NAS9-15487; NAS9-15850; NAS9-17151)
(NASA-CR-171877; NAS 1.26:171877; MTSC-2114-MED-5002)
Avail: NTIS HC A04/MF A01 CSCL 06S

The regulation of fluid and electrolyte behavior during space flight is believed to be under control, in large part, of a group of hormones which have their major effects on renal excretion. The hormones studied include renin-angitensin, aldosterone, and antidiuretic hormone (ADH). The regulatory systems of these renal-regulating hormones as they act individually and in concert with each other are analyzed. The analysis is based on simulations of the mathematical model of Guyton. A generalized theory is described which accounts for both short-term and long-term behavior of this set of hormones. E.A.K.

N85-26124*# Management and Technical Services Co., Houston, Tex.
FLUID-ELECTROLYTE RESPONSES DURING PROLONGED SPACE FLIGHT: A REVIEW AND INTERPRETATION OF SIGNIFICANT FINDINGS
Joel I. Leonard 1985 37 p refs
(Contract NAS9-17151)
(NASA-CR-171878; NAS 1.26:171878; MTSC-2114-MED-5008)
Avail: NTIS HC A03/MF A01 CSCL 06S

The most important results of the Skylab studies related to fluid-electrolyte regulation are summarized. These data are the starting point of a systems analysis to study adaptation to the weightlessness environment. A summary of the systems analysis study, including an interpretation of Skylab results, is included. E.A.K.

N85-26125*# Management and Technical Services Co., Houston, Tex.
MATHEMATICAL MODELING OF FLUID-ELECTROLYTE ALTERATIONS DURING WEIGHTLESSNESS
Joel I. Leonard 26 Jul. 1984 56 p refs
(Contract NAS9-17151)
(NASA-CR-171881; NAS 1.26:171881; TIR-2114-MED-4001) Avail: NTIS HC A04/MF A01 CSCL 06S

Fluid electrolyte metabolism and renal endocrine control as it pertains to adaptation to weightlessness were studied. The mathematical models that have been particularly useful are discussed. However, the focus of the report is on the physiological meaning of the computer studies. A discussion of the major ground based analogs of weightlessness are included; for example, head down tilt, water immersion, and bed rest, and a comparison of findings. Several important zero g phenomena are described, including acute fluid volume regulation, blood volume regulation, circulatory changes, longer term fluid electrolyte adaptations, hormonal regulation, and body composition changes. Hypotheses are offered to explain the major findings in each area and these are integrated into a larger hypothesis of space flight adaptation. A conceptual foundation for fluid electrolyte metabolism, blood volume regulation, and cardiovascular regulation is reported. E.A.K.

N85-26126# Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.
EYE MOVEMENT IN RESPONSE TO SINGLE AND MULTIPLE TARGETS Final Report, 1 Oct. 1981 - 31 Dec. 1983
R. V. Kenyon, Y. Y. Zeevi, P. A. Wetzel, and L. R. Young Brooks AFB, Tex. AF Human Resources Lab. Feb. 1985 120 p
(Contract F33615-81-K-0011)
(AD-A151115; AFHRL-TR-84-29) Avail: NTIS HC A06/MF A01 CSCL 06/16

Two major studies were pursued under this research program: one was devoted to eye-movement responses in multi-target situations, and the other to smooth scanning behavior when viewing eye-slaved targets. For multiple targets, a computer-controlled arc perimeter display comprised of 21 LED point targets (5 arc-minutes) placed 5 degrees apart was utilized. Results showed that oculomotor reaction time increased from 200 ms for single targets to 240 ms for multiple targets (20% to 25% increase). Furthermore, delaying the appearance of one of the targets by 10 ms increased the reaction time even further, to about 300 ms. Further increases in second target delay produced a monotonically decreasing function of response time versus delay, until at delays of 100 ms, the reaction times were normal. For the experiments on eye-slaved target scanning behavior, the subject was presented with a target controlled by that person's own eye position. This eye-slaved target was then delayed 1 to 200 ms before being presented to the subject. With no delay, subjects were able to move their eyes smoothly across the screen and back; i.e., self-initiated smooth pursuit. Small delays (40 to 60 ms) tended to increase the smooth pursuit oscillations in both velocity and amplitude. The results suggest that smooth pursuit is facilitated by small delays in the eye-position feedback signal. At larger delays (100-200 ms), smooth pursuit was not obtained. The implications of these results for eye-slaved, area-of-interest displays are discussed. Author (GRA)

N85-26127# Human Engineering Labs., Aberdeen Proving Ground, Md.
MODIFIED LANDOLT C-RING TEST TO MEASURE THE EFFECTS OF LASER FILTERS ON VISUAL ACUITY Final Report
O. Zubal Jan. 1985 35 p
(AD-A151164; HEL-TN-2-85) Avail: NTIS HC A03/MF A01 CSCL 05/5

The utility of the modified Landolt C-ring test in predicting gunner performance when optical (laser) filters were incorporated in the gunner's aiming/tracking sights was examined. Sixty-four qualified TOW and tank gunners participated in a quasi-tactical exercise during which they had to locate, identify, and simulate firing at targets using their respective sights. Sixty-three of the gunners were used to measure variations in their visual acuity caused by the filters which were being used in the tactical scenarios. GRA

N85-26128# School of Aerospace Medicine, Brooks AFB, Tex.
AIRSICKNESS CONTROL USING BIOFEEDBACK TO SELF-REGULATE PSYCHOPHYSIOLOGICAL RESPONSES Final Report, Aug. 1979 - May 1982
D. R. Jones, R. A. Levy, L. Gardner, R. W. Marsh, and J. C. Patterson Dec. 1984 17 p
(AD-A151167; USAFSAM-TR-84-34) Avail: NTIS HC A02/MF A01 CSCL 06/19

Investigators of the Neuropsychiatry Branch, Clinical Sciences Division, U. S. Air Force School of Aerospace Medicine (USAFSAM), provided biofeedback-moderated behavioral treatment to 53 fliers grounded for chronic, severe motion sickness, and followed each flier for 2 years after treatment completion. Success was defined as returning to and maintaining satisfactory operational flying status. Forty-two fliers (79%) met this criterion; three (6%) were partially successful, and eight (15%) were subsequently grounded for recurrent airsickness. Follow-on studies will investigate psychophysiological mechanisms through which this method of treatment works. GRA

N85-26129# School of Aerospace Medicine, Brooks AFB, Tex.
PSYCHOMETRIC EVALUATION OF HEAD INJURY AMONG FLIERS REFERRED TO THE AF SCHOOL OF AEROSPACE MEDICINE Final Report, 1 Jun. 1974 - 1 Mar. 1981
R. D. Wheatley Dec. 1984 26 p
(AF Proj. 7755)
(AD-A151479; USAFSAM-TR-84-47) Avail: NTIS HC A03/MF A01 CSCL 05/10

In support of U.S. Air Force Regulation 160-43, Medical Examination and Medical Standards, the Neuropsychiatry Branch of the USAF School of Aerospace Medicine (SAM) maintains consultation services in neurology, psychiatry, and clinical psychology for the aeromedical evaluation of fliers. From June 1974 to March 1981, 40 consecutive cases of closed head injury accumulated in the Branch; and each case received the thorough SAM Flight Medicine workup, plus psychometric and neurologic evaluations. The psychometric battery included measures of

intellect, memory, neuropsychologic and personality functioning. Of the head injury referrals, 60% received waivers to resume cockpit duties; and the results of their psychometric and neurologic evaluations were compared with those of fliers disqualified for flying duties. In this report are presented: a summary of differences between the groups; and a discussion of the apparent clinical as well as nonclinical determinants of flying status disposition after the SAM evaluation for closed head injury. GRA

N85-26130# Texas Univ., Austin.
MATHEMATICAL MODELS RELATING TO HUMAN THERMOREGULATION: BASIC ASSUMPTIONS, VALIDATION, AND APPLICATION. PARTS A AND B Final Report, 2 Mar. 1982 - 28 Feb. 1983
E. H. Wissler 2 Nov. 1984 190 p Presented at a workshop, Austin, Tex., 13-15 Dec. 1982 Dec. 1982
(Grant AF-AFOSR-MIPR-82-0214)
(AD-A151556; AFOSR-85-0181TR-Pt-A/B) Avail: NTIS HC A09/MF A01 CSCL 12/1

A workshop was held at The University of Texas at Austin in December 1982. The workshop evaluated available mathematical models which could be used to simulate human thermal behavior under various conditions. The program involved the following four activities; (1) obtain copies of the mathematical models, install them on computers located at the University of Texas, and verify that they were operating correctly, (2) collect sets of data suitable for testing mathematical models and enter them into a machine readable data base, (3) use the models to simulate the conditions represented by the experimental data, (4) discuss the simulated results with the authors of the models and a group of outstanding thermal physiologists who offer constructive criticism and suggestions for improving the models. Author (GRA)

N85-26131# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
COMPUTERIZED BIOPHYSICAL DATA ACQUISITION SYSTEM FOR MOTION SICKNESS STUDIES M.S. Thesis
D. G. Fitzpatrick, M. A. Rogers, and R. Williams Dec. 1984 222 p
(AD-A151691; AFIT/GE/GCS/ENG/84D-30) Avail: NTIS HC A10/MF A01 CSCL 09/2

A biophysical data acquisition system was integrated with a MASSCOMP MC500 computer to provide the foundation for a computerized motion sickness rehabilitation program. A user-friendly data acquisition system was developed to process several different channels of biophysical information from a subject. This system processes the data to create graphics for operator interaction on a real-time basis and stores data for later retrieval and analysis. The electrical schematics and frequency responses of the fabricated physiological monitoring equipment used to measure heart rate, gastric motility, respiration rate, skin pallor, intestinal tone, and eye movement were completed. GRA

N85-26132# Naval Health Research Center, San Diego, Calif.
ASSESSING THE SHORT- AND LONG-TERM HEALTH EFFECTS OF DECOMPRESSION SICKNESS AMONG US NAVY DIVERS Interim Report
A. Hoiberg Dec. 1984 18 p
(AD-A151887; NAVHLTHRSCHC-84-30) Avail: NTIS HC A02/MF A01 CSCL 06/5

This study identified the short- and and long-term health effects among U.S. Navy divers who suffered decompression sickness (DCS) during more than a decade (n = 362) and compared their hospitalization rates with a matched sample of divers who had no recorded diving accidents (n = 1,086). Of the 332 divers included in the analyses, results identified 251 individuals (75.6%) whose records contained no diving-related medical events after the DCS incident; no deaths and only three physical disabilities were attributed to DCS or diving. DCS divers had significantly higher rates than controls for total hospitalizations, symptoms and headache, diseases of the arteries and veins, and diseases of the pancreas, intestines, and gallbladder. No specific disease or time interval was identified as attributable to the DCS incident. Subsequent research should include medical information from outpatients' records and divers' questionnaires to determine with greater confidence the health risks that divers face as they pursue this Navy occupation. GRA

N85-26133# California Univ., Los Angeles. Dept. of Anatomy.
MEASUREMENT AND MODIFICATION OF SENSORY SYSTEM EEG (ELECTROENCEPHALOGRAPHIC) CHARACTERISTICS DURING VISUAL-MOTOR PERFORMANCE Annual Report, 30 Sep. 1983 - 29 Sep. 1984
M. B. Sterman 31 Oct. 1984 18 p
(Grant AF-AFOSR-0335-82)
(AD-A151901; AFOSR-85-0247TR) Avail: NTIS HC A02/MF A01 CSCL 06/16

Electroencephalographic (EEG) and performance measures were obtained from eight adult male subjects during a sequence of 18 trials over a six-hour period consisting of alternating performance and non-performance epochs in a flight simulation task. EEG data were subjected to a limited bandpass frequency analysis. Task engagement (performance) was associated with greater density in central cortical rhythmic patterns, while a reciprocal decrease was observed in parietal-occipital activity. The opposite relationship was observed during non-performance segments, with density greater in parietal-occipital data. This reciprocity was most consistent in the central 8-11 H and parietal-occipital 4-7 Hz bands. EEG activity from these two areas was also found to be modulated over time, with linear trends related to performance epochs. Central rhythmic activity tended to increase progressively over trials in performance epochs while parietal-occipital patterns showed the opposite trend. Parietal-occipital activity was greatest during non-performance epochs and both areas showed an in-phase periodic pattern, with a cycle duration approximating 90 minutes. GRA

N85-26134# Washington Univ., St. Louis, Mo. Dept. of Psychology.
A COMPARISON OF ALTERNATIVE ANALYTIC MODELS FOR EVENT RELATED POTENTIAL RECORDS Final Report
E. Hunt and P. Tianwattanatata Nov. 1984 26 p
(Grant AF-AFOSR-0289-83)
(AD-A151977; AFOSR-85-0249TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Principal Component Analysis is a technique that is widely used to extract component wave forms from event related potential (ERP) records. Analysis of simulated ERP records indicate that Principal Component Analysis may produce biased solutions in some cases. Two alternative methods of analysis are considered; confirmatory factor analysis and time series analysis. Confirmatory factor analysis provides superior results if the experimenter has reason to reject some component wave forms on a priori grounds. Time series analysis is preferable in situations in which the analysis can be conducted on only a few records. The ERP is a record of the electrical activity detected in the brain following the presentation of a stimulus. GRA

N85-26135# Army Research Inst. of Environmental Medicine, Natick, Mass.
PHYSIOLOGICAL DIFFERENCES BETWEEN MEN AND WOMEN IN EXERCISE-HEAT TOLERANCE AND HEAT ACCLIMATION
K. B. Pandolf, M. N. Sawka, and Y. Shapiro Feb. 1985 28 p
(DA Proj. 3E1-62777-A-879)
(AD-A152048; USARIEM-M-20/85) Avail: NTIS HC A03/MF A01 CSCL 06/16

The responses of men to changes in environmental temperature have provided a basis for the understanding of human heat tolerance and thermoregulation. There appears to be less certainty about the thermoregulatory patterns of women. Physiological responses to heat stress may differ between genders due to several factors which include the lower cardiorespiratory fitness, higher body fat content, lower body weight, and lower skin surface area and higher surface area-to-mass ratio of women compared to men. In addition, fluctuating horminal levels of estrogen and progesterone accompanying the menstrual cycle may influence

women's tolerance to heat stress. Since the US Army is currently composed of greater than 10% females, it has become necessary to examine heat responses of females to exercise-heat stress and heat acclimation. Our Institute has conducted experiments comparing men and women for exercise-heat tolerance and acclimation over a wide range of environmental conditions. GRA

N85-26136# Los Alamos Scientific Lab., N. Mex.
AEROSOL DEPOSITION ALONG THE RESPIRATORY TRACT AT ZERO GRAVITY: A THEORETICAL STUDY
B. H. Lehnert, D. M. Smith, L. M. Holland, M. I. Tillery, and R. G. Thomas 1984 16 p refs Presented at the Lunar Bases and Space Activities of the 21st Century Meeting, Washington, D.C., 29 Oct. 1984
(Contract W-7405-eng-36)
(DE85-006703; LA-UR-85-362; CONF-8410230-1) Avail: NTIS HC A02/F A01

The aerosol deposition model of the Task Group on Lung Dynamics is used to assess the regional deposition of particles ranging from 0.01 to 10 (MU)m diameter at two particulate densities, 1 and 4, during simulated tidal breathing and breathing during moderate to heavy exercise. The results suggest the gas exchange regions of the lungs of space travelers and residents are afforded some protection, relative to their Earth bound counterparts, against the deposition of particles due to the absence of gravity; and approximately 2 to 10 fold reduction in the efficiency of collection of particles > 0.5 (MU)m in diameter occurred in the pulmonary region during resting conditions and exercise. Deposition along the tracheobronchial tree, however, is not markedly altered in the absence of gravity, indicating airway sites contributing to this structure remain susceptible to insults by inhaled aerosols. DOE

N85-26137# Southwest Research Inst., San Antonio, Tex. Dept. of Bioengineering.
FUNCTIONAL IMPAIRMENT AND STRUCTUREAL CERVICAL INJURIES IN HUMAN SURROGATES Final Report, 31 Mar. 1980 - 31 Dec. 1983
J. B. Lennox, O. M. Anderson, C. D. White, and G. T. Moore Feb. 1984 106 p refs Sponsored by National Highway Traffic Safety Administration.
(PB85-167436; DOT-HS-806-635) Avail: NTIS HC A06/MF A01 CSCL 13L

A series of experiments was initiated for identifying injury mechanisms and developing criteria suitable for representing the spectrum of significant functional and structural neck injuries that could be sustained by car crash occupants. The first four experiments of a pilot, static, neck loading test series were conducted on anesthetized and/or fresh cadaveric, adult, female baboons. Mid-sagittal, planar, tensile head loading was increased until definitive structural failure (atlas-occipital subluxation) occurred. Neurophysiological testing demonstrated that cervical spinal cord function was seriously impaired at 17 to 52 percent of the structural failure load. The potential implications of these findings are discussed, relative to the understanding of injury mechanisms. GRA

N85-25657# Joint Publications Research Service, Arlington, Va.
SPACE BRAIN RESEARCH IN CHINA REPORTED
Mei Lei *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-013) 1 May 1985 p 83-90 refs Transl. into ENGLISH from Kongjian Kexue Xuebao (Beijing), v. 4, no. 4, Oct. 1984 p 326-329 (For primary document see N85-25652 15-31)
Avail: NTIS HC A07/MF A01

N85-26607*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CARDIOVASCULAR EFFECTS OF WEIGHTLESSNESS
Kendra Short *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 99-103 ref (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 06P

N85-26599*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WHAT IS BEING DONE TO CONTROL MOTION SICKNESS?
Yvette D. Hall *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 53-56 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 06E

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N85-26138 British Aerospace Dynamics Group, Bristol (England). Human Factors Dept.
VISUAL SEARCH STRATEGY PREDICTIONS: THE USE OF ASPECT RATIO AS A CUE
L. K. B. Holman Dec. 1981 40 p refs
(BAe-BT-12565) Copyright. Avail: Issuing Activity

The use of aspect ratio by observers, in addition to size and contrast, to guide fixations during search was studied. Results show that aspect ratio strongly affects search. The distribution of observer performance, based on size and contrast and aspect ratio effects, is described mathematically. An initial study of the effects of large differences in size or contrast between target and nontarget stimuli was also conducted. Author (ESA)

N85-26139*# Douglas Aircraft Co., Inc., Long Beach, Calif.
MENTAL WORKLOAD MEASUREMENT: EVENT-RELATED POTENTIALS AND RATINGS OF WORKLOAD AND FATIGUE
M. A. Biferno Jun. 1985 23 p refs
(Contract NAS2-11860)
(NASA-CR-177354; NAS 1.26:177354) Avail: NTIS HC A02/MF A01 CSCL 05I

Event-related potentials were elicited when a digitized word representing a pilot's call-sign was presented. This auditory probe was presented during 27 workload conditions in a 3x3x3 design where the following variables were manipulated: short-term load, tracking task difficulty, and time-on-task. Ratings of workload and fatigue were obtained between each trial of a 2.5-hour test. The data of each subject were analyzed individually to determine whether significant correlations existed between subjective ratings and ERP component measures. Results indicated that a significant number of subjects had positive correlations between: (1) ratings of workload and P300 amplitude, (2) ratings of workload and N400 amplitude, and (3) ratings of fatigue and P300 amplitude. These data are the first to show correlations between ratings of workload or fatigue and ERP components thereby reinforcing their validity as measures of mental workload and fatigue. Author

N85-26140# Army Construction Engineering Research Lab., Champaign, Ill.
A PRACTICAL SYSTEM FOR COLLECTING RELIABLE DATA ON THE SPACE-TIME BEHAVIOR OF PEOPLE Final Report
R. M. Dinnat and A. J. Averbuch Apr. 1984 25 p
(AD-A151174; CERL-TR-P-152) Avail: NTIS HC A02/MF A01 CSCL 14/2

Space-time behavior is determined by collecting data on people's movements and inferring a mathematical form which expresses their position in space with respect to time. Analysis of space-time behavior can potentially be useful to the military for training, security, and the planning and design of facilities for military installations. Data on time-space behavior is normally collected by human observers (usually by self-observation); therefore, its reliability is virtually impossible to determine. However, by replacing human operations with electronic operations, the major source of unpredictable error is eliminated. A conceptual system consisting of individual transmitters and receiver-recorders had been proposed to replace human operations with electronic operations for the collection of data on time-space behavior. This investigation

examined the technical feasibility of this concept by testing a simple prototype system. The system was shown to be technically feasible, as well as simple to use, and affordable. GRA

N85-26141# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE MEASUREMENT OF HUMAN TIME ESTIMATING ABILITY USING A MODIFIED JERISON DEVICE M.S. Thesis
D. C. Kinney Dec. 1984 80 p
(AD-A151870; AFIT/GSO/ENG/84D-2) Avail: NTIS HC A05/MF A01 CSCL 05/9

The first objective of this research was to design and fabricate a variation of the Jerison time estimation device. This modified Jerison device has the requirement of being STS compatiable; meaning it must be light weight, reliable, and totally self contained. The second objective of the research was to determine if providing feedback aids the subject in improving his TEA (Time Estimation Ability). When this research began the decision whether or not to provide the astronauts with a readout of their estimated time had not been made. The final objective of the research was to tailor the experiment to fit the STS environment and astronaut workloads. GRA

N85-26142# Massachusetts Inst. of Tech., Cambridge. Dept. of Psychology.
VISION ALGORITHMS AND PSYCHOPHYSICS Annual Scientific Report, 15 Jul. 1983 - 14 Jul. 1984
W. A. Richards Sep. 1984 24 p
(Contract F49620-83-C-0135)
(AD-A151888; AFOSR-85-0248TR) Avail: NTIS HC A02/MF A01 CSCL 06/16

Vision by man or machine is the useful symbolic descriptions form images of the world. Studies of human visual system provide valuable insights into the kinds of descriptions that will be the most useful, but little insight into the computational problems involved in deriving and manipulating theses descriptions. This research examines several computational problems associated with aspects of two- and three-dimensional vision. The solution to these problems includes the design and implementation of particular algorithms. Their efficiency and flexibility is compared with that of the human visual processor. GRA

N85-26143# Colorado Univ., Boulder.
SKILLED MEMORY Status Report, 1 Mar. 1984 - 15 Jan. 1985
K. A. Ericsson 1985 39 p
(Contract N00014-84-K-0250)
(AD-A152063) Avail: NTIS HC A03/MF A01 CSCL 05/10

The Principle Investigator proposes to investigate memory processes underlying expertise. For their earlier contract period, he and Bill Chase studied the development of memory skills, concentrating primarily on individuals who have trained their digit spans from a normal span of about 7 digits to spans as high as 85 digits. Recently, they have also analyzed the memory skills of a mental calculation expert, the mnemonic skills of a waiter who is able to remember at least 20 menu orders without any form of memory aid, and normal people's memory for exact wording of prose material. The methodology, they have employed involves a combination of protocol analysis, computer simulation modeling, and experimental hypothesis testing. They have also been primarily concerned with extensive analyses of expert subjects and long-range training of dedicated subjects over hundreds of hours, although they have also conducted short-range studies with larger samples of subjects. Because they are interested in expert-level memory performance, their methodology is inherently constrained by the time-consuming nature of expertise. GRA

N85-26144# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.
CORRELATIONS BETWEEN SELECTION RATINGS AND SUCCESS AS ARMY AVIATORS
Anders Carlstroem Dec. 1984 30 p refs
(FOA-C-53020-H2; ISSN-0347-7665) Avail: NTIS HC A02/MF A01

The correlations between selection ratings and performance of Swedish Army aviation trainees were calculated. The results show very low and mostly insignificant correlations, possibly due to the selection procedures already passed by the applicants. Author (ESA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N85-26145 British Aerospace Dynamics Group, Bristol (England). Human Factors Dept.
PROCEEDINGS OF THE BAe HUMAN FACTORS SEMINAR
P. O. Day Oct. 1981 41 p ref Proc. held at Filton, England
(BAe-BT-11873) Copyright. Avail: Issuing Activity

Vision modeling; assessment of cockpits for female pilots; display system design; systems human factors; aircraft assembly environments; flight crew workload measurement; remote operation of submersibles; man-computer interaction; and seat assessment techniques were discussed. Author (ESA)

N85-26146 British Aerospace Dynamics Group, Bristol (England). Human Factors and Acquisition Research Dept.
AN MRTD-COMPATIBLE BAR PATTERN RESPONSE MODEL FOR TV AND DIRECT VIEW SIGHTING SYSTEMS
I. Overington Nov. 1981 18 p refs
(BAe-BT-12090) Copyright. Avail: Issuing Activity

In order to be able to compare the performance of direct view telescopes and TV sighting systems directly with that of thermal imagers a bar pattern response model compatible with MRTD was set up. The need for caution in use of bar pattern models for general and absolute system performance assessment is stressed. Limitations are listed and extensions of bar pattern response are discussed. The ORACLE/CYCLOPS model is recommended for absolute performance modeling with aperiodic stimuli. Author (ESA)

N85-26147 British Aerospace Dynamics Group, Bristol (England). Human Factors Dept.
HUMAN FACTORS DEPARTMENT 1981 PUBLICATIONS
J. L. Evans Jan. 1982 26 p refs
(BAe-BT-12685) Copyright. Avail: Issuing Activity

About 90 papers covering human factors of remotely controlled systems; gun aiming; sight performance modeling; man computer interaction; target acquisition; and vision modeling are listed. Author (ESA)

N85-26148# Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE HUMAN ENGINEERING OF LABORATORY DATA ACQUISITION AND CONTROL SYSTEMS Final Technical Report
M. A. DeWilde Dec. 1984 30 p
(DA Proj. 1L1-61102-AH-43)
(AD-A151576; AD-F300581; BRL-TR-2623) Avail: NTIS HC A03/MF A01 CSCL 05/5

Some special considerations concerning the human element in the design of laboratory automation are discussed. Techniques for architecturing entire systems, as well as applications programs, are discussed. GRA

N85-26149# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
FIRE PIT TESTS OF BLUE FLIGHT COVERALL PROGRAM Final Report
G. Kydd and J. C. Marano Nov. 1983 33 p
(AD-A151884; NADC-83118-60) Avail: NTIS HC A03/MF A01 CSCL 15/5

Twelve test garments of the Blue Flight Coverall Program were tested for fire protection in the NADC Fuel Fire Test Facility.

Manikins with their surfaces sensored for temperature and dressed in the Coverall were passed through the flames fueled by JP-4 for two second intervals. The mean percentage body burned was 26.83% with a range of 4.0 and 49.5%. These results are discussed in terms of the total system of protection available to the fully clothed airman. GRA

N85-26150# Research Inst. of National Defence, Stockholm (Sweden). Lab. for Man and Information Systems.
[ACTIVITIES REPORT FOR FOA 53: LABORATORY FOR MAN AND INFORMATION SYSTEMS] Annual Report, 1983 - 1984
Oct. 1984 17 p refs
(FOA-C-53019-H; ISSN-0347-7665) Avail: NTIS HC A02/MF A01

Research concerning color graphics and coding; image quality in graphical displays; a hand sized terminal for coded combat orders; mental models in information seeking; reading textual information from VDU's; dynamic decision making; a computer aided display system for surveillance; user centered design and the computers of 1990; electronic displays of flight information; and analyses of helicopter pilot performance is summarized. Author (ESA)

N85-26603*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM
Kenneth Ko *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 77-78 ref (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 06K

N85-26604*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS (CELSS)
Mousumi Majumdar *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 81-87 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 06K

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

N85-26566*# Arizona Univ., Tucson. Lunar and Planetary Lab.
THE IMPACT EJECTION OF LIVING ORGANISMS INTO SPACE Abstract Only
H. J. Melosh *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 59-62 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 06B

N85-26567*# Los Alamos Scientific Lab., N. Mex. Isotope and Nuclear Chemistry Div.
A SEARCH FOR EVIDENCE OF LARGE BODY EARTH IMPACTS ASSOCIATED WITH BIOLOGICAL CRISIS ZONES IN THE FOSSIL RECORD Abstract Only
C. J. Orth, J. S. Gilmore, and J. D. Knight *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 63-67 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 06B

N85-26609*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE
Ann Tucher *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 109-110 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 03C

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N85-26151 British Aerospace Dynamics Group, Bristol (England). Missile Design Dept.
LOGIC ANALYZER SURVEY AND REVIEWS
M. I. Hull 24 Apr. 1982 9 p
(BAe-881/ELO/1645) Copyright. Avail: Issuing Activity

Logic analyzers to find fault problems on 8 and 16 bit microprocessor systems were compared. The ENERTEC analyzer is the easiest to use and has a very large, clear display. The GOULD LA500 is easy to use but does not have as many facilities (the number of channels can not be easily expanded). The DOLCH Analyzers have the smallest displays (which can be overcome by feeding a separate monitor via an interface circuit), are the most difficult to learn how to use (possibly due to the number of facilities offerred) but have the best facilities and specification. Author (ESA)

N85-26152*# City Univ. of New York, N. Y.
MULTI-ACCESS FIBER OPTIC DATA BUS USING FDM/FSK Final Report, Oct. 1983 - Sep. 1984
Henry Zanger Oct. 1984 15 p
(Contract NCC2-108)
(NASA-CR-175739; NAS 1.26:175739) Avail: NTIS HC A02/MF A01 CSCL 09B

The major thrust was to develop a T coupler with very low (0.1 0.2dB) in-line loss. This is essential to any multiaccess bus structure where the word multi implies fifteen or more nodes on the bus, and it is tacitly assumed to be a passive bus. (Reliability considerations tend to exclude the use of active nodes - repeater nodes.) G.L.C.

N85-26153*# Illinois Univ., Urbana. Dept. of Computer Science.
RESEARCH IN THE DESIGN OF HIGH-PERFORMANCE RECONFIGURABLE SYSTEMS Semiannual Status Report, 1 Oct. 1984 - 31 Mar. 1985
Scott D. McEwan and Andrew J. Spry 1985 53 p refs
(Grant NAG5-377)
(NASA-CR-175705; NAS 1.26:175705; SASR-3) Avail: NTIS HC A04/MF A01 CSCL 09B

Computer aided design and computer aided manufacturing have the potential for greatly reducing the cost and lead time in the development of VLSI components. This potential paves the way for the design and fabrication of a wide variety of economically feasible high level functional units. It was observed that current computer systems have only a limited capacity to absorb new VLSI component types other than memory, microprocessors, and a relatively small number of other parts. The first purpose is to explore a system design which is capable of effectively incorporating a considerable number of VLSI part types and will both increase the speed of computation and reduce the attendant programming effort. A second purpose is to explore design techniques for VLSI parts which when incorporated by such a system will result in speeds and costs which are optimal. The proposed work may lay the groundwork for future efforts in the extensive simulation and

measurements of the system's cost effectiveness and lead to prototype development. E.A.K.

N85-26154# Karlsruhe Univ. (West Germany). Inst. fuer Informatik.
WORKSHOP ON PARALLEL COMPUTER ARCHITECTURES IN PATTERN RECOGNITION AND IMAGE PROCESSING Final Report, Nov. 1983
Michael Engel and Peter Nitezki Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 207 p refs Partly in GERMAN and ENGLISH Workshop held in Karlsruhe, West Germany, 24-25 Nov. 1983 Sponsored by Bundesministerium fuer Forschung
(BMFT-FB-DV-84-006; ISSN-0170-9011) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 38

Parallel computer architectures for image processing; a multiprocessor system and its application for pattern recognition; and industrial applications of pattern recognition and image processing are presented. The recognition of objects in their natural environment and image processing architectures are treated. The introduction of very large scale integration in pattern recognition and image processing, and a review of computer architecture for image processing and pattern recognition are presented. For individual titles, see N85-26155 through N85-26161.

N85-26155# Karlsruhe Univ. (West Germany). Forschungszentrum Informatik.
POSING OF THE PROBLEM, STATUS, AND FUTURE OF PARALLEL COMPUTER ARCHITECTURE FOR IMAGE PROCESSING [PROBLEMSTELLUNG, STAND UND ZUKUNFT DER PARALLELEN RECHNERARCHITEKTUREN FUER DIE BILDVERARBEITUNG]
P. Levi *In its* Workshop on Parallel Computer Architectures in Pattern Recognition and Image Processing Dec. 1984 p 18-33 In GERMAN (For primary document see N85-26154 15-60)
Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 38

Fundamentals, status, and future of computer architecture and parallel computers are treated. The characteristics of digital image processing and pattern recognition are explained. The concepts computer architecture, parallel processing, and algorithms are defined. The status of computer architecture in the Federal Republic of Germany is presented. Von Neumann architecture in image processing is discussed. Author (ESA)

N85-26156# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Mathematische Maschinen und Datenverarbeitung (Informatik).
THE EGPA MULTIPROCESSOR SYSTEM AND ITS POSSIBLE APPLICATION FOR PATTERN RECOGNITION TASKS [DAS EGPA-MEHRPROZESSOR-SYSTEM UND SEINE MOEGLICHE VERWENDUNG FUER MUSTERERKENNUNGSAUFGABEN]
G. Fritsch and D. Jaepel *In* Karlsruhe Univ. Workshop on Parallel Computer Architectures in Pattern Recognition and Image Processing Dec. 1984 p 34-46 refs In GERMAN (For primary document see N85-26154 15-60)
Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 38

The EGPA multiprocessor system and its utilization for pattern recognition are presented. The basic characteristics of the microprocessor architecture are given. The EGPA pilot-pyramid and the parallel processing test results are explained. The EGPA architecture allows the construction of multiprocessor systems with higher calculation efficiency. The complexity of the pattern recognition problem spectrum is depicted. Processing of patterns, computer architectures for pattern processing, design of pattern processing systems, and determination of good characteristics in pattern recognition are discussed. The implementation of algorithms on the EGPA multiprocessor system is outlined. Author (ESA)

N85-26157# Technische Univ., Munich (West Germany). Lehrstuhl fuer Prozessrechner.
INDUSTRIAL APPLICATIONS OF PATTERN RECOGNITION AND IMAGE PROCESSING [INDUSTRIELLE ANWENDUNGEN DER MUSTERERKENNUNG UND BILDVERARBEITUNG]
G. Faerber *In* Karlsruhe Univ. Workshop on Parallel Computer Architectures in Pattern Recognition and Image Processing Dec. 1984 p 47-96 In GERMAN (For primary document see N85-26154 15-60)
Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 38

The processing and classification of two-dimensional image patterns in industrial applications are presented. Image processing applications in industry (measuring tasks, quality control tasks, work piece identification) are shown. The stepwise procedure of the development and introduction of image processing system for complex tasks is explained. Author (ESA)

N85-26158# Forschungsgruppe fuer Informationsverarbeitung und Mustererkennung, Karlsruhe (West Germany).
RECOGNITION OF OBJECTS IN THEIR NATURAL ENVIRONMENT [OBJEKTERKENNUNG IN NATUERLICHER UMGEBUNG]
W.-D. Groch and P. Gemmar *In* Karlsruhe Univ. Workshop on Parallel Computer Architectures in Pattern Recognition and Image Processing Dec. 1984 p 57-71 refs In GERMAN (For primary document see N85-26154 15-60)
Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 38

Recognition methods for objects in their natural environment are discussed. An efficient use of most of the methods is only possible if the required calculation times are reduced by the use of technologies allowing the rapid execution of instructions, and especially by the parallel execution of tasks. The applied methods are generally so complex that they cannot be reduced to a systematic application of parallel operations. The methods can be executed in a parallel way by exploiting inherent parallelism and by static or dynamic parallelization; however this involves high requirements for the data processors. It is concluded that more emphasis should be put on the aspect parallelization during the conception of the method. Author (ESA)

N85-26159# Karlsruhe Univ. (West Germany).
INNOVATIVE IMAGE PROCESSING ARCHITECTURES [INNOVATIVE BILDVERARBEITUNGS-ARCHITEKTUREN]
W. K. Giloi *In its* Workshop on Parallel Computer Architectures in Pattern Recognition and Image Processing Dec. 1984 p 72-86 refs Partly in GERMAN and ENGLISH (For primary document see N85-26154 15-60)
Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 38

Data flow architecture and data structure architecture are discussed. A high performance data type architecture for iconic processing is presented; the array processor operates in the Simd mode and performs up to 40 million arithmetic operations per second. Pyramid building and an important property of the pyramid are explained. Steps in computer vision with the processor P256, P256 digitizer/frame buffer/preprocessor circuits, and P256 co-processor hardware interfaces are shown. A multiarray computer for high performance iconic and symbolic processing is presented. Author (ESA)

N85-26160# Siemens A.G., Munich (West Germany).
INFLUENCE AND POSSIBILITIES OF VERY LARGE SCALE INTEGRATION (VLSI) IN PATTERN RECOGNITION AND IMAGE PROCESSING [EINFLUSS UND MOEGLICHKEITEN VON VLSI AUF DIE MUSTERERKENNUNG UND BILDVERARBEITUNG]
Gerd Sandweg *In* Karlsruhe Univ. Workshop on Parallel Computer Architectures in Pattern Recognition and Image Processing Dec. 1984 p 87-114 In GERMAN (For primary document see N85-26154 15-60)
Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 38

The introduction of VLSI in pattern recognition and image processing is treated. The machine layout for the production of integrated circuits (IC) is schematically shown. Problems connected with the application of VLSI are discussed. The architecture of the hardware and software structure of a functional concept is schematized. Methods of IC design, multiplication, programming, sequentialization, hierarchy formation, simple processor structure, slice-technique, data flow, command coding, CAD tools, and design automation are presented. Author (ESA)

N85-26161# Karlsruhe Univ. (West Germany).
COMPUTER ARCHITECTURE FOR IMAGE PROCESSING AND PATTERN RECOGNITION IN THE FEDERAL REPUBLIC OF GERMANY. STATUS 1983, A REVIEW [RECHNERARCHITEKTUR FUER BILDVERARBEITUNG UND MUSTERERKENNUNG IN DER BUNDESREPUBLIK DEUTSCHLAND. STAND 1983, EIN UEBERLICK]
Michael Engel and Peter Nitezki *In its* Workshop on Parallel Computer Architectures in Pattern Recognition and Image Processing Dec. 1984 p 115-213 refs In GERMAN (For primary document see N85-26154 15-60)
Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 38

The machines studied in the framework of investigations on suitable computer architectures for image processing and pattern recognition are reviewed. Utilization and design aspects, operational system and programming, and software and hardware components are described for each machine. The problems related to parallel processing are emphasized. Author (ESA)

N85-26162# Purdue Univ., Lafayette, Ind. Dept. of Computer Sciences.
VERY LARGE LEAST SQUARES PROBLEMS AND SUPERCOMPUTERS
J. R. Rice 31 Dec. 1984 17 p
(Contract DAAG29-84-M-0194)
(AD-A151270; ARO-20219.4-MA) Avail: NTIS HC A02/MF A01 CSCL 09/2

The goals of the workshop were: (1) to provide an interchange between different groups working on very large least squares problems, (2) to provide an interchange between computer scientists involved with supercomputer systems and scientists using supercomputers and, (3) to assess the state of the art in solving very large least squares problems. Twelve sources of very large least squares problems were identified the ones principally involved in the discussions were: Geodetic surveys; Photogrammetry; Molecular structures; Gravity field of the Earth; and Partial differential equations. GRA

N85-26163# Naval Postgraduate School, Monterey, Calif.
THE DESIGN AND IMPLEMENTATION OF A SYNTAX DIRECTED EDITOR FOR A SPACE CONSTRAINED MICROCOMPUTER M.S. Thesis
R. F. Richbourg Jun. 1984 101 p
(AD-A151313) Avail: NTIS HC A06/MF A01 CSCL 09/2

Syntax directed editors (SDE) have been built to support popular languages or subsets of those languages. Typically, these implementations require large amounts of computing resources. This work describes the design and implementation of a SDE which requires less than 58 thousand bytes of main memory and supports the full C programming language. Several extant SDE models are examined in an effort to define a basic set of SDE facilities. Design principles are combined with machine constraints to produce a plan for the implementation of these facilities. A sample session with the resulting editor is provided. The syntactic irregularities of the C programming language are examined. A discussion showing how language irregularities can hamper the implementation of a SDE follows. A grammatical definition of the C language is included. Additional keywords: theses, c programming language, programming manuals. Author (GRA)

N85-26164# Naval Postgraduate School, Monterey, Calif.
INTERACTIVE DATA ANALYSIS. DEVELOPMENT OF AN INTERACTIVE DATA MANIPULATION SYSTEM M.S. Thesis
N. G. Totos Jun. 1984 223 p
(AD-A151359) Avail: NTIS HC A10/MF A01 CSCL 09/2

Large amounts of data collected during experiments or produced as outputs of programs that simulate systems, usually need further treatment in order to complete the research task. One step of the data analysis process is the manipulation of the data. The data, even when stored in a computer, can be considered as inert if it cannot be manipulated. Manipulation may be considered any appropriate arrangement or transformation of a logical data matrix composed by the data. The inert data matrix is activated and becomes an Active Matrix by the developed system IDAMAN (Interactive Data Manager). It is expected that this system, based on the idea of Dr. Daniel Guinier, fulfills the demands for such manipulations. Compared to existing similar alternative systems, this system possesses two particular merits: No specific language is required; and the separation of data manipulation task from acquisition and future calculus grants to the system a high power of expandability. GRA

N85-26165# Materials Research Labs., Ascot Vale (Australia).
THE INTERACTIVE PLOTTING PROGRAM: GRAPH
S. R. Kennett Nov. 1984 65 p
(AD-A151371; MRL-TN-485) Avail: NTIS HC A04/MF A01 CSCL 09/2

This technical note is intended to form a user guide to the interactive graphics program called GRAPH. GRAPH is a command driven interactive program which allows the user with only limited computer experience to display and modify graphical data. The program can plot data on linear or logarithmic axes. The axes can be set by the user or autoscaled by the program. Labels can be added and changed and text can be written to any part of the plot. This function is suitable for the production of vu-graphs. Data can also be plotted as points, histograms or lines. GRAPH has commands to perform simple numerical analysis. Data can be multiplied, divided, added or subtracted by a constant value or by a second set of data. Data can also be integrated, differentiated or smoothed. Least squares polynomials can be fitted to data. GRAPH was written in FORTRAN 77 on the VAX 11/780 computer at the Materials Research Laboratories. GRA

N85-26166# Purdue Univ., Lafayette, Ind. Dept. of Computer Sciences.
SUPERCOMPUTERS AND SYMBOLIC COMPUTATION
D. S. Arnon 31 Dec. 1984 30 p
(Contract DAAG29-84-M-0194)
(AD-A151376; CSD-TR-481; ARO-20219.2-MA) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report is the record of a two-day workshop held at Purdue University on high-performance symbolic computation. The title Symbolic computation and supercomputers reflects the interests of the participants, many of whom are practitioners of symbolic computing on supercomputer-class machines. The goal of the workshop was to assess the current state of affairs, and identify key issues requiring attention. The report is primarily a compendium of the positions taken, recommendations made, and questions raised by the participants. GRA

N85-26167# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CONTINUED DEVELOPMENT OF A DATA BASE MANAGEMENT SYSTEM PERFORMANCE MONITOR, VOLUME 2 M.S. Thesis
T. D. Bruner Dec. 1984 295 p
(AD-A151714; AFIT/GCS/ENG/84D-6) Avail: NTIS HC A13/MF A01 CSCL 09/2

This investigation focuses on the problem of analyzing the performance data collected on a Data Base Management System (DBMS). The performance data parameters are categorized and presented to the user using a Data Support System (DSS). The generalized design for a DBMS performance monitor was used to design a user-friendly interface to DBMS performance data. The user interface ot the DBMS performance monitor uses menus to allow the user to select DBMS performance parameter values.

The DBMS performance parameter values can also be printed in the form of a performance report. The design was implemented on a VAX 11/780 computer system using the VMS operating system. The TOTAL DBMS was used to collect performance data. The performance values were collected using existing software monitors, job accounting, system error log, an a utility developed at AFIT to collect Data Manipulation Language (DML) response performance data. GRA

N85-26168# Defence Research Establishment, Ottawa. (Ontario).
DESIGN SPECIFICATIONS FOR IMAGER: THE DREO (DEFENCE RESEARCH ESTABLISHMENT OTTAWA) IMAGE PROCESSING SYSTEM
C. Brochu, R. Ball, K. Lim, and S. Sorensen Sep. 1983 162 p
(AD-A151752; DREO-TN-82-15) Avail: NTIS HC A08/MF A01 CSCL 09/2

This Canadian document enunciates the detailed design specifications for the development of image processing software (first three releases) for the DREO (Defence Research Establishment, Ottawa) Image Processing System consisting of a Data General Eclipse S-130 computer equipped with a NORPAK RGP-3050 Image Processor. A top-down structured design technique approach is used. It is composed of data and file formats, structure charts and programming specifications for all modules. These modules allow image transfer and manipulation, system parameters bookkeeping and multispectral and monospectral image analysis techniques. The user manual is AD-A151 754. GRA

N85-26169# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
BACKEND CONTROL PROCESSOR FOR A MULTI-PROCESSOR RELATIONAL DATABASE COMPUTER SYSTEM M.S. Thesis
D. M. Pontiff Dec. 1984 239 p
(AD-A151892; AFIT/GCS/ENG/84D-22) Avail: NTIS HC A11/MF A01 CSCL 09/2

This theses discusses the design and development of a control processor for a multi-processor relational database machine. The objective was to create the software needed to allow a micro-processor to receive relational query trees from a frontend processor, and to distribute the work load between several other slave processors. The requirement analysis of the controller determined that the controller must provide three major functions within the backend database machine. It must assign slave processors to query operations, control the system paging, and manage file creation and deletion. Next, the thesis proves that each query operation can be successfully split across several slave processors and the results be recombined to provide the same response as a query executed on a single processor. Finally, the thesis gives a detailed description of the software algorithms used by the BCP to manage the backend system. GRA

N85-26170# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DEVELOPMENT OF A USER SUPPORT PACKAGE FOR CPESIM 2 (A COMPUTER SIMULATION FOR CPE (COMPUTER PERFORMANCE EVALUATION) USE M.S. Thesis
D. L. Petty Dec. 1984 159 p
(AD-A151899; AFIT/GCS/ENG/84D-21) Avail: NTIS HC A08/MF A01 CSCL 09/2

In 1983 a SLAM computer simulation was developed to be used as an educational tool in computer performance evaluation (CPE) and Queueing Theory classes at AFIT, Lack of user friendliness and additional requirements necessitated the development of a user friendly interface, i.e. this thesis effort. The interface consists of two programs: one for the instructor and one for his students. The students' interface allows them to modify and display the initial or subsequently modified computer configurations and to do a data reduction and histogram analysis on output software monitor data after a simulation run. Any student configuration changes are stored in an Ingres database. The instructor's interface allows him to easily create initial configuration, the cataloog of available hardware, and the system's workload of one to ten jobstreams. He can also display any or all configurations of any or all student teams on his terminal or direct that display to a file for later printing. The interface as a whole is menu-driven, user friendly, and very portable; it operates on any UNIX system (which has Ingres and SLAM) regardless of the hardware (including terminals) that the operating system is implemented on. A student and instructor user's manual is provided. GRA

N85-26171# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN EXTENSION OF A MICROCOMPUTER BASED SYSTEM FOR ANALYSIS OF LINE DRAWING QUANTIZATION SCHEMES M.S. Thesis
T. A. Morris Dec. 1984 211 p
(AD-A152008; AFIT/GE/ENG/84D-48) Avail: NTIS HC A10/MF A01 CSCL 09/2

This thesis describes the extension of a microcomputer based system to analyze the performance of various grid based line drawing quantization schemes. The system is developed on a Heathkit H-89 microcomputer with a Hewlett-Packard 9874A digitizer and a Hiplot digital plotter. The capabilities of the existing system were expanded to allow real time digitizing/plotting operations and to provide for encoding and analysis using variable ring quantization schemes. Comparisons of specific drawings were then made for various quantization schemes based on a distortion metric (area between original and quantized image), a rate metric (number of bits in the quantization), and a subjective evaluation of the smoothness of the quantized image. Results indicate that multi-ring codes usually produce less distortion in the quantized image than single ring codes and require less bits for storage. Also, neither metric is a good indicator of the smoothness of the quantized image. GRA

N85-26172# Department of Energy, Washington, D. C. Office of Energy Research.
ROLE OF SUPERCOMPUTERS IN ENERGY RESEARCH PROGRAMS
Feb. 1985 135 p refs
(DE85-006865; DOE/ER-0218) Avail: NTIS HC A07/MF A01

The small amount of Class 5 (current supercomputer) time available to the EB community is totally inadequate. During FY81, when a small amount of such computing was made available to the EB community through the Energy Sciences Advanced Computation Program (ESACP), the hours requested exceeded the availability by an order of magnitude. The requirements for aggregate capacity and for capability for large problems demands the acquisition of yet more powerful computers than a single Class 5 computer. The capability issue is primarily a matter of the limited addressability for a single program in today's Class 6 computers. Some problems require memory sizes an order of magnitude larger than available in Class 5 machines. Other capability limitations arise in problems where it is impractical to explicit in a rational way the high performance features or the current vector oriented supercomputers. Other architectures now under development may prove to be more effective for a wide range of EB problems. This report contains representative examples of known unsatisfied computing needs in DOE's Energy Research community and recommendations on how to accommodate these needs. DOE

N85-26173# National Bureau of Standards, Washington, D.C.
FUTURE INFORMATION TECHNOLOGY, 1984 TELECOMMUNICATIONS Final Report
P. Kay and P. Powell Dec. 1984 343 p refs Prepared in cooperation with Little (Arthur D.), Inc., Aurora Associates, Inc., Titan Systems, Inc. and International Data Corp.
(PB85-165850; NBS/SP-500/119; LC-84-601149) Avail: NTIS HC A15/MF A01; also available SOD HC $9.50 as SN003-003-02626-3 CSCL 09B

Telecommunications technology and related areas in computer organization are discussed. Four primary concerns are mentioned: the telecommunications forecast, through 1999, three perspectives on the divestiture of AT&T, a discussion of the general impacts of technology on computer security, and the management implications of the trends in information technology. Additionally, the

summary of an industry workshop on this forecast, a brief update of the 1983 forecast, and a glossary of terms are presented. GRA

N85-26174# Joint Publications Research Service, Arlington, Va.
USSR REPORT: CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY
23 Apr. 1985 105 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UCC-85-003) Avail: NTIS HC A06

U.S.S.R. research reports on cybernetics, computers and automation technology are presented. Specifically, subject matter covered includes: (1) hardware technology, (2) software; and (3) computer applications and architecture. For individual titles, see N85-26175 through N85-26179.

N85-26175# Joint Publications Research Service, Arlington, Va.
COMPUTER TECHNOLOGY ADVANCES EXHIBITED
A. Longinov *In its* USSR Rept.: Cybernetics, Computers (JPRS-UCC-85-003) 23 Apr. 1985 p 13-16 Transl. into ENGLISH from Izv. (Moscow), 21 Nov. 1984 p 2 (For primary document see N85-26174 15-60)
Avail: NTIS HC A06

The SM-1600 minicomputer is discussed, which combines the capabilities and advantages of control machines (such as the SM-4) and problem-oriented machines used for processing statistical information such as the M-5000 (M-5010, M-5100) PVK perforation computer complex). The architectural and structural design of this minicomputer is based on the conceptions and integrated design element base of the SM computer. The SM-1600 minicomputer is based on the integrated use of a master processor and a specialized processor. Other structural features which make this minicomputer unique are discussed. he SM-1600 is highly efficient in solving statistical and economic planning problems. B.W.

N85-26176# Joint Publications Research Service, Arlington, Va.
EFFECTIVE MICROINSTRUCTION PIPELINE ORGANIZATION IN A HIGH-CAPACITY MICROPROCESSOR
V. V. Novoselov *In its* USSR Rept.: Cybernetics, Computers (JPRS-UCC-85-003) 23 Apr. 1985 p 17-22 ref Transl. into ENGLISH from Mekh. i Avotmat. Upr. (Kiev), no. 3, Jul. - Sep. 1984 p 38-41 (For primary document see N85-26174 15-60)
Avail: NTIS HC A06

The efficiency of a microprogrammable processor (MP) with a fixed structure and a fixed means of processing microinstructions is defined in terms of execution times for microprograms making up a given microprogram control algorithm and characterizes the degree of correspondence between MP structure/microprogram processing means and algorithm characteristics. Therefore, different algorithms and even segments of a single algorithm require different MP structural and processing solutions. Thus, an increase in the extent of pipeline handling permits a reduction in timing cycle duration, but also leads to an increase in the number of cycles required for the execution of conditional branches resulting from a prior operation. An MP structure/instruction processing design solution called the adaptive microinstruction pipeline was developed to assure maximum efficiency in the execution of both sequential and arbitrary algorithm segments. B.W.

N85-26177# Joint Publications Research Service, Arlington, Va.
PRINCIPLES OF ORGANIZING A REAL-TIME CONTROL SYSTEM **c62**
A. F. Verlan and V. V. Galkin *In its* USSR Rept.: Cybernetics, Computers (JPRS-UCC-85-003) 23 Apr. 1985 p 33-39 refs Transl. into ENGLISH from Dokl. Akad. Nauk Ukr. SSR, Ser. A: Fiz.-Mat. i Tekh. Nauki (Kiev), no. 11, Nov. 1984 (For primary document see N85-26174 15-60)
Avail: NTIS HC A06

When designing and using software for real-time control systems, special difficulties are caused by the process of searching for and eliminating program errors. It is known that the cost of software in comparison with the cost of computer hardware is increasing constantly and by 1985 will constitute 90 percent of the total cost of computer systems, of which 50-60 percent will be spent on debugging. An important feature of real-time programming is multitasking during joint use of computer system resources (processors, data, programs, peripherals) under the control of a strict time schedule and random flow of demands for service. This presents rigid requirements for the debugging and monitoring devices to minimize the use of the resources of the real-time system, and especially during the process of conducting complex program adjustments and tests. Techniques necessary for efficient organization of Software control in complex automation systems are discussed. B.W.

N85-26178# Joint Publications Research Service, Arlington, Va.
HIGH-CAPACITY REAL-TIME COMPUTER SYSTEM FOR PROCESSING HYDROPHYSICAL DATA
I. I. Brodskiy, V. A. Kozlachkov, I. I. Korshever, V. S. Lvov, S. L. Musher, Yu. E. Nesterikhin, S. A. Pavlov, A. A. Predtechenskiy, I. G. Remel, and A. V. Shafarenko *In its* USSR Rept.: Cybernetics, Computers (JPRS-UCC-85-003) 23 Apr. 1985 p 61-74 refs Transl. into ENGLISH from Avotmetriya (Novosibirsk, USSR), no. 5, Sep. - Oct. 1984 p 3-12 (For primary document see N85-26174 15-60)
Avail: NTIS HC A06

Computational methods for processing data for hydro- and hydrodynamic experiments have been improved. Besides the traditional processing methods - spectral and correlation analysis - approaches associated with use of regression analysis, adaptive methods of spectral assessment, etc., have been developed. Various algorithms for filtering data have been widely used in studying the problem of the origin of hydrodynamic turbulence; the results of multiple-point measurements of time functions of liquid flow rates made it possible to study the topological properties of attractions in the effective phase space, in particular, to measure fractal and information dimensionality. This program, processed on modern high capacity computers, has no promise within the framework of analog processing methods traditional in hydrophysics. A real-time high capacity computer system for processing hydrophysical data was developed. The architecture of this system is described in detail. B.W.

N85-26179# Joint Publications Research Service, Arlington, Va.
MINI- AND MICROCOMPUTER LOCAL CONTROL NETWORK ARCHITECTURE AND DESIGN PRINCIPLES
V. A. Ivanov, A. A. Cherevko, and V. N. Yatsenko *In its* USSR Rept.: Cybernetics, Computers (JPRS-UCC-85-003) 23 Apr. 1985 p 76-81 refs Transl. into ENGLISH from Mekh. i Avtomat. Upr. (Kiev), no. 3, Jul. - Sep. 1984 p 56-58 (For primary document see N85-26174 15-60)
Avail: NTIS HC A06

Application of the network concept to organize communication between computers allows the creation of effective local area networks (LANs) for use not only in institutes and foundations, but also as control networks in plants within various branches of the national economy. The high reliability, high data transmission speeds (up to 100 Mbps), low cost and significant savings in communication lines offered by LANs permit their use as the basis for automation and control systems. Of the LAN configurations in current use--bus, star and ring--the latter is characterized by the greatest simplicity, lowest cost and, because of the use of repeaters, its capacity for assuring communications over the greatest distance. A multiple ring LAN configuration has been developed. Two types of hardware resources distinguished in the network are discussed. B.W.

N85-25331# Joint Publications Research Service, Arlington, Va.
CZECH INSTITUTE DEVELOPS MICROCOMPUTER FOR SATELLITES Abstract Only
In its USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 92 Transl. into ENGLISH from Moskovskaya Pravda (USSR), 17 Oct. 1984 p 4 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25579# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF SPECTRAL CHARACTERISTICS OF MULTI-

LEVEL DIGITAL COMPUTING SYNTHESIS Abstract Only
S. Ya. Shishov and N. P. Yampurin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 12 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Kiev), v. 27, no. 10, Oct. 1984 p 66-68 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25592# Joint Publications Research Service, Arlington, Va.
STRUCTURIZATION OF PROGRAMS FOR REAL-TIME MICROPROCESSOR ARRAYS Abstract Only
B. M. Rakhimbekov and A. N. Varfolomeyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 57 refs Transl. into ENGLISH from Electrosvyaz (Moscow), no. 9, Sep. 1984 p 33-35 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25876# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
CADS: A COMPUTER AIDED DESIGN SYSTEM
Victoria A. Tischler, Elizabeth M. Copenhaver, Michael C. Less (Rockwell International Corp., Los Angeles), and Susan Manuel (Rockwell International Corp., Los Angeles) *In* NASA, Washington 13th NASTRAN Users Colloq. May 1985 p 199-224 refs (For primary document see N85-25863 15-39)
Avail: NTIS HC A20/MF A01; also available from COSMIC, Athens, Ga. CSCL 09B

N85-26184# Hill Kaplan Scott, Inc. (South Africa).
COMPUTERS AND THE CONSULTING ENGINEER
A. D. Tuff *In* South African Inst. of Civil Engineering Symp. on Computers in Civil Eng., 1983 1983 15 p (For primary document see N85-26182 15-61)
Avail: NTIS HC A10/MF A01

N85-26186# International Federation of Computer Users in Engineering, Architecture and Related Fields (South Africa).
PROGRESS THROUGH COOPERATION AND EXCHANGE OF IDEAS AND EXPERIENCES
G. Kruisman *In* South African Inst. of Civil Engineering Symp. on Computers in Civil Eng., 1983 1983 11 p refs (For primary document see N85-26182 15-61)
Avail: NTIS HC A10/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N85-26180 British Aerospace Dynamics Group, Bristol (England). Electronics Group.
USING A LOGIC ANALYSER AND TRIGGER UNIT TO DE-BUG A PROGRAM
3 Feb. 1982 5 p
(BAe-881/ELO/1487) Copyright. Avail: Issuing Activity

A logic analyzer was used to investigate an interrupt service routine written to generate a simulated PCM serial bit-stream. Although this routine output the data correctly, it corrupted at least one other memory location unrelated to it. A trigger probe unit was used to freeze the trace in the analyzer at the instant the CPU wrote to the corrupted address. The faulty instruction was replaced with a different sequence to perform the required function and no further memory corruption took place. The reason for failure of the first sequence is not established. Author (ESA)

N85-26181 British Aerospace Dynamics Group, Bristol (England). Guidance and Control Dept.
COMPUTER PROGRAM TRAMP: INCLUSION OF STATE SPACE FACILITIES AND THE ANALYSIS OF NON-LINEAR ELEMENTS
A. J. Clough Feb. 1982 39 p refs
(BAe-BT-12643) Copyright. Avail: Issuing Activity

The changes and extensions made to the computer program TRAMP to include the facility of analyzing systems using the state-space representation, and of analyzing systems including a single nonlinear element are presented. Another section is added to calculate the overall transmittence of a network, given the system flow graph, using Mason's Rule. Author (ESA)

N85-26182# South African Inst. of Civil Engineers, Pretoria. Electronic Computation Div.
SYMPOSIUM ON COMPUTERS IN CIVIL ENGINEERING 1983
1983 210 p refs Symp. held in Pietermaritzburg, South Africa, 30 Aug. 1983
(CSIR-S-298; ISBN-0-7988-2672-X) Avail: NTIS HC A10/MF A01

Topics covered include: computers; information dissemination; computer aided design; computer aided drafting; management communication; financial models; data acquisition systems; and design optimization. For individual titles, see N85-26183 through N85-26190.

N85-26183# Witwatersrand Univ., Johannesburg (South Africa).
FUTURE DIRECTIONS IN COMPUTERS
C. H. Hoogendorn *In* South African Inst. of Civil Engineering Symp. on Computers in Civil Eng., 1983 1983 11 p refs (For primary document see N85-26182 15-61)
Avail: NTIS HC A10/MF A01

The forces driving computer technology today are discussed and their impact on tomorrow's computing environment is examined. For the professional engineer the key development will be the personal professional workstation, integrating computer-aided design and electronic office facilities. Author

N85-26184# Hill Kaplan Scott, Inc. (South Africa).
COMPUTERS AND THE CONSULTING ENGINEER c60
A. D. Tuff *In* South African Inst. of Civil Engineering Symp. on Computers in Civil Eng., 1983 1983 15 p (For primary document see N85-26182 15-61)
Avail: NTIS HC A10/MF A01

The implementation of computers within the total consulting engineering environment from administration through to project management is discussed. The advantages to be had by creating an integrated system and describes the various areas of application are outlined. Current design software is discussed and the means for its needed improvement are suggested. Author

N85-26185# Lawless (Allyson) (Proprietary) Ltd. (South Africa).
PROGRAMME DEVELOPMENT: A STATE OF THE ART
A. Lawless *In* South African Inst. of Civil Engineering Symp. on Computers in Civil Eng., 1983 1983 10 p refs (For primary document see N85-26182 15-61)
Avail: NTIS HC A10/MF A01

The 1960's heralded computer aided analysis for large complex projects via software developed mainly by large institutions. With an increasing number of people involved in the use of computers and with the advent of the mini and desktop computers a trend towards in-house software development was established. This involved primarily the adjustment of the large general purpose programs towards the specialist needs of the particular company and the creation of the smaller programs by members of staff for the less demanding applications. The introduction of graphics facilities during the seventies gave rise to the emergence of the specialist software firms who were mainly responsible for changing the emphasis of the term C.A.D. from design to drafting. The possibility of saving engineers time and that of the draftsman as well, was an immediate attraction, and an immediate success. With the design and drafting aspects of computing being two separate fields to data it is envisaged that the main demand in the future will be towards software in which the two fields become increasingly integrated. Author

N85-26186# International Federation of Computer Users in Engineering, Architecture and Related Fields (South Africa).
PROGRESS THROUGH COOPERATION AND EXCHANGE OF

IDEAS AND EXPERIENCES c60
G. Kruisman *In* South African Inst. of Civil Engineering Symp. on Computers in Civil Eng., 1983 1983 11 p refs (For primary document see N85-26182 15-61)
Avail: NTIS HC A10/MF A01

The objectives of the Federation of Computer Users in Engineering (FACE) are: (1) to group organizations of computer users in engineering, architecture and related fields from different countries in order to act as a central source of information; (2) to promote the establishment of user organizations where none exist; (3) to stimulate bi-lateral exchange of information between computer users; (4) to encourage portability of software between computers, interchange of software between member organizations, and to promote the establishment and use of standard procedures and formats; and (5) to cooperate with other international organizations on matters of mutual interests. The history of face and the activities in Australia, Netherlands, Great Britain, and the United States are discussed. B.G.

N85-26187# Liebenberg and Stander, Consulting Engineers, Cape Town (South Africa).
AN APPROACH FOR USER CONTROLLED REINFORCED CONCRETE DESIGN OPTIMIZATION c31
P. C. Olsen *In* South African Inst. of Civil Engineering Symp. on Computers in Civil Eng., 1983 1983 16 p refs (For primary document see N85-26182 15-61)
Avail: NTIS HC A10/MF A01

A method of designing the longitudinal reinforcement of a biaxially loaded reinforced concrete section is developed. State equations are formulated as functions of state and design variables, resulting in an underdetermined system of equations. By applying methods from nonlinear mathematical programming these questions are solved in such a way in terms of both state and design variables that a minimum area of the reinforcement is provided. Results are compared with those of existing design aids. The method is applied to the design of a T-box section. Author

N85-26188# Natal Univ., Pietermaritzburg (South Africa). Dept. of Agricultural Engineering.
COMPUTERS IN THE DETERMINATION OF RAINFALL SEPTH-DURATION-FREQUENCIES IN NATAL c47
R. E. Schulze *In* South African Inst. of Civil Engineering Symp. on Computers in Civil Eng., 1983 1983 48 p refs (For primary document see N85-26182 15-61)
Avail: NTIS HC A10/MF A01

The computerization of autographic rain gauge records in Natal is reviewed by discussing first the steps in the development of a digitized data base for deriving Depth-Duration-Frequency values. Following an overview of D-D-F methods currently in use in South Africa, and highlighting problems associated with those methods, a comparison is made between D-D-F results from conventional and digitized data bases. Marked divergences show up which can result in significant differences in estimates of peak discharge rates. Author

N85-26189# Lillicrap, Wassenaar and Partners, Johannesburg (South Africa).
COMPUTER AIDED DRAUGHTING IN A CIVIL ENGINEERING CONSULTING PRACTICE
J. M. Fee *In* South African Inst. of Civil Engineering Symp. on Computers in Civil Eng., 1983 1983 21 p refs (For primary document see N85-26182 15-61)
Avail: NTIS HC A10/MF A01

The Computer Aided Draughting system operated by the Consulting Engineering firm of Lillicrap Wassenaar & Partners, Johannesburg are discussed. As the name implies this system is used at present as a draughting air only, and not for any design. The motivation, selection, choice of system, site preparation, staff selection, method of operation, security, productivity, costing and future development in detail are described. Author

N85-26190# Ninham Shand, Inc. (South Africa).
MANAGEMENT COMMUNICATION AND FINANCIAL MODELING c82
H. N. P. Pells *In* South African Inst. of Civil Engineering Symp. on Computers in Civil Eng., 1983 1983 10 p refs (For primary document see N85-26182 15-61)
Avail: NTIS HC A10/MF A01

The basis of modern management is effective communication. Recent developments in the field of data communication by the South African Post Office, the establishment of a South African Library Network and the development of program writing financial modeling systems have all improved communication and thence the effectiveness of management. These developments are reviewed. Author

N85-26191*# National Aeronautics and Space Administration, Washington, D. C.
PROGRAMMING THE DIGITAL COMPUTER ODRA-1204 IN MOST-2 LANGUAGE
G. M. Zharkov 1977 83 p refs Transl. into ENGLISH of "Programmirovaniye dlya Tsifrovoy Vychislitelnoy Mashiny ODRA-1204 na Yazyke MOST-2" Moscow, no. 17 p 1-58 Transl. by Agence Tunisienne de Public-Relations, Tunis, Tunisia Original doc. prep. by Inst. of Mechanics, Moscow State Univ.
(Contract NSF-C-504)
(NASA-TM-87462; NASA-TT-F-17166; NAS 1.15:87462) Avail: NTIS HC A05/MF A01 CSCL 09B

A handbook for programming the ODRA-1204 digital computer in MOST-2 language is presented. This publication is composed of a description of the language, several methodical constructions concerning the programming in this language, and also offers a sufficient number of examples. The necessary reference material is listed in tabular form in the appendix. This publication is meant for students, engineering Master's candidates and for scientific associates. It is assumed that the reader is familiar with the general problems of programming. E.A.K.

N85-26192*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CARE 3 MODEL OVERVIEW AND USER'S GUIDE, FIRST REVISION
S. J. Bavuso and P. L. Petersen Apr. 1985 150 p refs Previously announced as N83-12864 and N84-28514; supersedes NASA-CR-16584 and NASA-TM-85810
(NASA-TM-86404; NAS 1.15:86404) Avail: NTIS HC A07/MF A01 CSCL 09B

A manual was written to introduce the CARE III (Computer-Aided Reliability Estimation) capability to reliability and design engineers who are interested in predicting the reliability of highly reliable fault-tolerant systems. It was also structured to serve as a quick-look reference manual for more experienced users. The guide covers CARE III modeling and reliability predictions for execution in the CDC CYber 170 series computers, DEC VAX-11/700 series computer, and most machines that compile ANSI Standard FORTRAN 77. Author

N85-26193*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFICIENT IMPLEMENTATION OF REAL-TIME PROGRAMS UNDER THE VAX/VMS OPERATING SYSTEM
Sally C. Johnson May 1985 24 p refs
(NASA-TM-86354; L-15900; NAS 1.15:86354) Avail: NTIS HC A02/MF A01 CSCL 09B

Techniques for writing efficient real-time programs under the VAX/VMS oprating system are presented. Basic operations are presented for executing at real-time priority and for avoiding needless processing delays. A highly efficient technique for accessing physical devices by mapping to the input/output space and accessing the device registrs directly is described. To illustrate the application of the technique, examples are included of different uses of the technique on three devices in the Langley Avionics Integration Research Lab (AIRLAB): the KW11-K dual programmable real-time clock, the Parallel Communications Link (PCL11-B) communication system, and the Datacom Synchronization Network.

Timing data are included to demonstrate the performance improvements realized with these applications of the technique. Author

N85-26194*# Management and Technical Services Co., Houston, Tex.
ADDENDUM TO THE STCAL AND LTCAL USER'S GUIDE
Susan N. Brand 1 May 1985 29 p
(Contract NAS9-17151)
(NASA-CR-171880; NAS 1.26:171880; TIR-2114-MED-5011) Avail: NTIS HC A03/MF A01 CSCL 09B

The expanded calcium model, identified by the acronym LTCAL (for Long Term Calcium), has been modified extensively in most of the skeletal and phosphorus subsystem models. G.L.C.

N85-26195# Lockheed-Georgia Co., Marietta.
ADVANCED LIFE ANALYSIS METHODS. VOLUME 6: USER'S MANUAL FOR LUGRO COMPUTER PROGRAM TO PREDICT CRACK GROWTH IN ATTACHMENT LUGS Final Report, 3 Sep. 1980 - 30 Sep. 1984
K. Kathiresan and T. R. Brussat Wright-Patterson AFB, Ohio AFWAL Sep. 1984 128 p 6 Vol.
(Contract F33615-80-C-3211)
(AD-A151235; LG82ER0117-6; AFWAL-TR-84-3080-Vol-6) Avail: NTIS HC A07/MF A01 CSCL 09/2

This report is Vol. VI of a 6-part final report on the work conducted under AFWAL contract. The objective of this research program is to develop the design criteria and analytical methods necessary to ensure the damage tolerance of aircraft attachment lugs. This volume describes the computer program LUGRO developed under this contract and provides user input instructions and input and output data for some sample problems. LUGRO is an automated computer program which has been developed using the state-of-the-art methodologies to predict the residual strength and fatigue crack growth behaviors of single through-the-thickness cracks and single corner cracks at attachment lugs. This section further describes the operation of the program, functions of the main program and the subroutines, and a flow-chart of the computer program, GRA

N85-26196# Defence Research Establishment Atlantic, Dartmouth (Nova Scotia).
GRID: A FORTRAN PROGRAM FOR USING A DIGITIZING TABLE TO ENTER A FINITE ELEMENT GRID
B. A. Armstrong Nov. 1984 21 p
(AD-A151317; DREA-TM-84/Y) Avail: NTIS HC A02/MF A01 CSCL 09/2

An important initial step in any finite element analysis is the generation of the finite element grid, which is a list of nodes and their co-ordinates, and a list of finite elements, i.e., how the nodes are grouped together. The quickest and most reliable method to generate a finite element grid is automatically with a computer, but it is not economical to do so unless the same genre of problem is to be analyzed many times. If the grid is not generated automatically, a graph of the grid must be drawn, and later entered into the computer by some means. Typographical entry of the data is time consuming and prone to error, so we have written a FORTRAN computer program, GRID, which uses a digitizing table to greatly speed up data entry compared with typographical entry. This report describes GRID, and provides an example of how GRID is used. GRID has been written specifically for the two-dimensional finite element program MAVART, but most of its subroutines are either of general applicability, or could be readily modified to meet the requirements of other finite element programs. The first section defines the task for which GRID was written. Subsequent sections describe the organisation of GRID, the initialization procedure, and the layout of the switch box, and step-by-step instructions on how to digitize the small grid shown in Section 2. GRA

N85-26197# Mitre Corp., McLean, Va.
INFINITE COMPUTING
H. Abarbanel, P. Banks, C. Callan, K. Case, and A. Despain Jan. 1985 20 p
(Contract F19628-84-C-0001)
(AD-A151437; JSR-84-116) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report presents ideas on what might be done if one had infinite computing capability. Infinite is arbitrarily defined as 100-1000 Cray-1's. The ideas are intended to be suggestive rather than definitive. Author (GRA)

N85-26198# Naval Postgraduate School, Monterey, Calif.
DESIGN AND ANALYSIS OF A COMPLETE RELATIONAL INTERFACE FOR A MULTI-BACKEND DATABASE SYSTEM M.S. Thesis
R. E. Rollins Jun. 1984 121 p
(AD-A151501) Avail: NTIS HC A06/MF A01 CSCL 09/2

Organizations of all types are becoming increasingly dependent on the operation of database management systems based on one of the three generally known data models (i.e., network, hierarchical or relational) for the centralized control of operational data. As an alternative to the development of separate, stand-alone systems for specific models, recent research has proposed a system designed to support multiple data models and model-based languages as if the system is a heterogeneous collection of database systems. This proposal is based on the existence of a simple and powerful data model to which three well-known models can be mapped. This model, the attribute-based data model is the data model upon which the Multi-Backend Database System (MDBS), a software database machine, is based. This thesis concentrates on the language interface aspects of implementing MDBS as a kernel for the support of relational databases. In particular, this thesis provides the design and analysis of an interface between the relational query language (SQL) and the attribute-based data language (ABDL). Author (GRA)

N85-26199# Purdue Univ., Lafayette, Ind. Dept. of Computer Sciences.
BLAS (BASIC LINEAR ALGEBRA SUBROUTINES), LINEAR ALGEBRA MODULES AND SUPERCOMPUTERS Technical Report, period ending 15 Dec. 1984
J. R. Rice 31 Dec. 1984 17 p
(Contracts DAAG29-84-M-0194; N00014-84-K-0012)
(AD-A151504; CSD-TR-501; ARO-20219.3-MA) Avail: NTIS HC A02/MF A01 CSCL 09/2

On October 29 and 30, 1984 about 20 people met at Purdue University to consider extensions to the Basic Linear Algebra Subroutines (BLAS) and linear algebra software modules in general. The need for these extensions and new sets of modules is largely due to the advent of new supercomputer architectures which make it difficult for ordinary coding techniques to achieve even a significant fraction of the potential computing power. The workshop format was one of informal presentations with ample discussions followed by sessions of general discussions of the issues raised. This report is a summary of the presentations, the issues raised, the conclusions reached and the open issue discussions. Each participant had a opportunity to comment on this report, but it also clearly reflects the author's filtering of the extensive discussions. Section 2 describes seven proposals for linear algebra software modules and Section 3 describes four presentations on the use of such modules. Discussion summaries are given next; Section 4 for those where near concensus was reached and Section 5 where the issues were left open. Author (GRA)

N85-26200# Naval Postgraduate School, Monterey, Calif.
A LEARNING STRATEGY APPROACH FOR TEACHING NOVICE COMPUTER PROGRAMMERS M.S. Thesis
D. D. Begley Sep. 1984 85 p
(AD-A151523) Avail: NTIS HC A05/MF A01 CSCL 09/2

The purpose of this thesis is to investigate various learning strategies and present some suggested applications for the teaching of computer programming to Marine Corps entry-level programmers. These learning strategies are used to develop a cognitively designed structure for the teaching of the software engineering process. This structure was designed so that programmers could have readily available in their thinking process modern

software engineering goals and principles that ultimately affect the quality of software. Also suggested at a lower level of the overall structure is a syntax and semantics organizer. This particular framework serves as an advance organizer for which specific programming language features could be introduced. This structure can act as an organizing mechanism for the introduction of various, useful programming chunks that would start the novice programmer on his quest to becoming an expert. Author (GRA)

N85-26201# Army Industrial Base Engineering Activity, Rock Island, Ill.
CAD/CAM (COMPUTER-AIDED DESIGN/COMPUTER-AIDED MANUFACTURING) HIGHLIGHTS Final Report
D. L. Richardson Oct. 1984 137 p
(AD-A151532; AD-E700014) Avail: NTIS HC A07/MF A01 CSCL 13/8

This document contains summaries of Army Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) efforts that are either completed or ongoing. The Army CAD/CAM Program funds efforts through a wide variety of sources and AMC programs. Significant information contained in this document was obtained from various management documents submitted to IBEA in the data collection cycle. AMC Major Subordinate Commands, Installations, Activities and Program Offices as well as defense contractors, are the sources for this management data. The summaries highlight the integration of computers in the material development and production environment. They are organized into eleven sections under the following subject headings: Architecture; Fabrication; Data Base/Data Automation; CAD/CAM Interaction; Planning and Group Technology; Manufacturing Control; Assembly; Simulation, Modeling and Operations Research; Materials Handling and Storage; Test, Inspection and Evaluation; and Continuous Flow Processes. GRA

N85-26202# Software Options, Inc., Cambridge, Mass.
THE DEVELOPMENT OF A PROGRAMMING SUPPORT SYSTEM FOR RAPID PROTOTYPING. TASKS 2 AND 3 Final Report, Jan. 1984 - Jan. 1985
Jan. 1985 160 p
(Contract N00014-82-C-0173)
(AD-A151549; SO-01-85) Avail: NTIS HC A08/MF A01 CSCL 09/2

The principal work in Task 2 was the design of a new method for code-generation, particularly oriented to the needs and capabilities of the programming support environment. The central tenet is that there must be a more intimate coupling between register allocation and instruction selection than exists in present-day technology. This is achieved by generating code in very small regions and gradually coalescing the part of the program that is compiled. Task 3 was to have been an effort to prototype some of the code-generation ideas developed in Task 2, in particular, an analyzer that builds an intermediate form for bi-directional scanning of a program, a necessary constituent of the optimizing code-generator. Task 3 also called for developing overall specifications for the Rulog language and the interpreter and developing a prototype for the interpreter. Due to the limitation of funds, only a design, not a prototype, of the bi-directional scanner was eventually supported; this work is reported on in the second document included in this report. The work on Rulog is reported on in an included paper, The RULOG Inferencing Engine. GRA

N85-26203# Naval Postgraduate School, Monterey, Calif.
THE DESIGN AND ANALYSIS OF A COMPLETE HIERARCHICAL INTERFACE FOR THE MULTI-BACKEND DATABASE SYSTEM M.S. Thesis
D. J. Weishar Jun. 1984 91 p
(AD-A151550) Avail: NTIS HC A05/MF A01 CSCL 09/2

Typically, the design and implementation of a conventional database system begins with the choice of a data model, the specification of a model-based data language, and the design and implementation of a database system which controls and executes the transactions written in the data language. For example, we have the hierarchical model, the DL/I language and the Information Management System. By using an unconventional approach to the design and implementation of a basic database system, we can design a system to support multiple data models and several model-based languages as if they system is a heterogeneous collection of database systems. This thesis presents a methodology for supporting hierarchical database management on an attribute-based data-base system. Specifically, we construct an interface which translates Data Language/One (DL/I) calls into attribute-based language requests. The author describes the data structures, the control structures, and the functions required to implement this interface. GRA

N85-26204# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ADA (TRADEMARK) TASKING AND EXCEPTIONS: A FORMAL DEFINITION M.S. Thesis
D. W. Gonzalez 1985 89 p
(AD-A151618; AD-E301607; AFIT/CI/NR-85-28T) Avail: NTIS HC A05/MF A01 CSCL 09/2

The formal language definition method used by Niklaus Wirth to describe the Euler programming language is applied to the Ada tasking and exception mechanisms. Packages are also included to the extent that they interact with tasks. A brief overview of each mechanism is given, accompanied by a detailed explanation of salient portions of the Euler method. The two phases of the definition, translation and execution, are detailed in the appendices followed by examples. Minutiae important to the design of a complementary sequential definition are detailed. GRA

N85-26205# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A MICROCOMPUTER-BASED PROGRAM FOR PRINTING CHECK PLOTS OF INTEGRATED CIRCUITS SPECIFIED IN CALTECH INTERMEDIATE FORM M.S. Thesis
K. S. Horton Dec. 1984 347 p
(AD-A151715; AFIT/GE/ENG/84D-35) Avail: NTIS HC A15/MF A01 CSCL 09/2

Mcifplot, a microcomputer-based program which prints check plots of integrated circuits on a dot-matrix printer, was designed, implemented, and tested. The SADT Design, Detailed Design, Data Dictionary, algorithms, Structure Charts, and program code are presented. Mcifplot interprets a geometric description file written in Caltech Intermediate Form (CIF) and produces an output file which can be printed using the public domain program PLOT.COM. Mcifplot is written in C for the CPM operating system and closely matches the function of the Unix based VLSI design tool cifplot. Mcifplot interprets all standard CIF 2.0 commands with the exception of Poly Commands, Delete Definition Commands, and commands which define geometric elements in non-Manhattan directions. Program execution is primarily limited by disk access delays and depends greatly on the format and structure of the input CIF file. GRA

N85-26206# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PRELIMINARY DESIGN OF THE Ada PROGRAMMING SUPPORT ENVIRONMENT CONFIGURATION MANAGER M.S. Thesis
S. M. Schultz Jun. 1984 82 p
(AD-A151845; AFIT/GCS/ENC/82D-12) Avail: NTIS HC A05/MF A01 CSCL 09/2

Today the development and maintenance of software are becoming prohibitively costly. With the goal of reducing the cost of producing a software system without sacrificing the quality of it, the Department of Defense (DOD) is sponsoring the development of the Ada Programming Support Environment (APSE). This thesis explains the APSE. It also explains the requirements and gives a preliminary design of one of the major tools of the APSE, the configuration manager. The preliminary design of this tool is presented using Structured Analysis and design Technique (SADT) diagrams. The preliminary design includes only a functional description of the configuration manager. Prior to presenting the preliminary design of the configuration manager, a description of how Software Configuration Management (SCM) is currently practiced is given. SCM is divided into four functions. They are

configuration identification (CI), configuration control (CC), status accounting can be completely automated. Therefore, the preliminary design emphasizes the SA function. GRA

N85-26207# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EXTENSION OF THE SOFTWARE DEVELOPMENT WORKBENCH TO INCLUDE MICROCOMPUTER WORKSTATIONS M.S. Thesis
P. A. Moore Dec. 1984 501 p
(AD-A151903; AFIT/GCS/ENG/84D-18) Avail: NTIS HC A22/MF A01 CSCL 09/2

The purpose of this investigation is to (1) design an integrated and automated software development environment for microcomputers, (2) to implement a portion of that environment and, (3) to modify the VAX-11/780 VMS Software Development Workbench to support microcomputer workstations. The central portion to initial microcomputer software development environment is a flexible user interface adapted from a previous microcomputer software development effort. The user interface is enhanced by an extensive installation program which allows (1) terminal definition, (2) help message specification and, (3) reconfiguration of the keyword menu system. The result of the investigation is a prototype software development environment hosted on DEC Rainbow 100 microcomputer under three operating systems: CP/M-80, CP/M-86, and MS-DOS. The environment includes a flexible user interface, an installation program, a communications program, and an initial library of reusable software. GRA

N85-26208# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
ON THE THROUGHPUT OF CHANNEL ACCESS ALGORITHMS WITH LIMITED SENSING
P. A. Humblet 16 Jan. 1985 5 p Revised
(Contract N00014-84-K-0357; Grant NSF ECS-83-10698; DARPA Order 3045; DA Proj. 5T1-0)
(AD-A151984; LIDS-P-1426) Avail: NTIS HC A02/MF A01 CSCL 09/3

This document considers protocols for Aloha type multiaccess channels. It is argued and shown in an important case, that they can be modified to allow new access transmitters to join the system at arbitrary times. This feature, known as limited sensing or free entry, does not reduce throughput performances. In the case presented, the modified algorithm is also robust with respect to feedback errors. GRA

N85-26209# National Technical Information Service, Springfield, Va.
CATALOG OF THE NATIONAL ENERGY SOFTWARE CENTER
1984 171 p
(TI85-900521; PB84-906299) Avail: NTIS HC A08/MF A01

The 1984 catalog of the national energy software center is presented. The catalog lists and briefly describes various software available for sale. G.L.C.

N85-26210# Sandia Labs., Albuquerque, N. Mex.
ESTIMATION THEORY APPLIED TO IMPROVING DYNAMIC STRUCTURAL MODELS
D. R. Martinez Nov. 1984 40 p refs
(Contract DE-AC04-76DP-00789)
(DE85-004148; SAND-82-0572) Avail: NTIS HC A03/MF A01

Key results from the field of estimation theory are presented. In particular, results are given which are applicable to the problem of improving dynamic structural models to agree with test data. This problem is referred to as structural dynamics parameter identification or reconciliation of analytical models. Pertinent results from both parameter and state estimation are discussed as background information for the development of the iterated extended Kalman filter (EKF) for parameter estimation. The well-known least squares parameter estimation, recursive linear estimation, and iterative batch nonlinear estimation. Included are a definition of related parameter estimation algorithms and a discussion of the conditions required for their commonality. Next, the linear Kalman filter and extended Kalman filter equations for optimal state estimation are given, as well as a discussion of the additional generality introduced to obtain the iterated EKF equations. The structural dynamics parameter identification problem is then imbedded into the more general state estimation framework as a special simplified case. DOE

N85-26211# California Univ., Livermore. Lawrence Livermore Lab.
REENTRANCY AND MULTITASKING ON CRAY COMPUTERS
Gary J. Blair 9 Jan. 1985 25 p refs
(Contract W-7405-eng-48)
(DE85-007256; UCID-30199) Avail: NTIS HC A02/MF A01

Multiprocessing at Lawrence Livermore National Laboratory (LLNL) is now possible because the Livermore Computer Center (LCC) received a CRAY Z-MP/24 in mid-February 1984. The two processors of the X-MP focused on a single problem can theoretically solve a problem in half the time required by one processor (i.e., the speed-up factor = 2). The four-processor CRAY X-BR/48 could cut the solution time by four. While the theoretical times may not be possible in practice, some preliminary investigations indicate that the processing time can be reduced by factors of 1.8 to 1.9 with the two-processor CRAY. To achieve this, however, requires, that current programming methods be changed, and this, in turn, will introduce new problems in writing and debugging programs. DOE

N85-26212# California Univ., Livermore. Lawrence Livermore Lab. Controls and Analysis Group.
PRAXIS LANGUAGE ENVIRONMENT: DISTRIBUTION PACKAGE DESCRIPTION, REVISION 1
James M. Duffy (C.G.A. Computer, Inc., Des Plaines, Ill.), Frederick W. Holloway, Anthony J. DeGroot, and Timothy A. Sherman 18 Jan. 1985 32 p
(Contract W-7405-eng-48)
(DE85-006699; UCID-30196-Rev-1) Avail: NTIS HC A03/MF A01

The organization, generation, distribution and archival of the complete Praxis language system are described. Included are three compilers and several associated products. This distribution should give users the current binary versions of the compilers and support packages as well as the sources to generate these images. DOE

N85-26213# Illinois Univ., Urbana. Dept. of Computer Science.
MATRIX: A PROGRAM THAT SHOWS HOW ROW AND COLUMN ORDERINGS AFFECT MATRIX FILL-IN
T. J. Woodburn Nov. 1984 18 p ref
(Contract DE-AC02-76ER-02383)
(DE85-007522; UIUCDCS-R-84-1171; UILU-ENG-84-1745; COO-2383-0105) Avail: NTIS HC A02/MF A01

Gaussian elimination is a useful method for solving systems of linear equations. In sparse systems, fill-in occurs during the forward course of the elimination; that is, zero entries in the coefficient matrix are replaced by non-zero values. This fill-in is bad for two reasons: it takes up valuable storage space, it also prolongs the elimination. Reordering the rows and columns of the matrix can reduce fill-in significantly. A computer program, MATRIX, which lets the user see how the row and column orderings of the matrix affect fill-in is reviewed. The program uses a matrix obtained by solving Poisson's equation over a closed region. The user first outlines the region on a square grid. Then a system of equations is generated by applying a five-point formula to each grid point within the region. The coefficient matrix of this system is displayed on the terminal screen. Only its structure - which elements are zero, which are non-zero - is shown. The program can show which elements of the matrix would be filled-in during Gaussian elimination. The use can reorder the rows and columns of the matrix and see how the fill-in changes. DOE

N85-26214# California Univ., Livermore. Lawrence Livermore Lab.
VAX-BASED GRAPHICS MAIL SYSTEM
D. P. Wiltzius 11 Jan. 1985 11 p refs Presented at the Fall

DECUS Symp., Anaheim, Calif., 10 Dec. 1984
(Contract W-7405-eng-48)
(DE85-007231; UCRL-91674; CONF-841249-2) Avail: NTIS HC A02/MF A01

Graphics messages (freehand drawings, text, and symbols) can be interactively created using an intelligent graphics terminal (Tektronix 4115B) and selectively sent to othe graphics terminals for display, editing, and return transmission. This VAX-based program is run as several detached process to handle the message routing. Interprocess communication is achieved with VMS mailboxes and asynchronous software traps (AST's) are utilized for all input in order to maintain low system overhead and fast, asynchronous response. DOE

N85-26215# Princeton Univ., N. J.
INTERACTIVE GRAPHICAL DATA ANALYSIS Final Report, 25 Mar. 1981 - 30 Sep. 1984
John W. Tukey and J. Michael Steele Nov. 1984 33 p
(Contract DE-AC02-81ER-10841)
(DE85-005946; DOE/ER-10841/15) Avail: NTIS HC A03/MF A01

A summary of data analysis techniques employing computer graphics is reviewed. An organization of effort is presented under the four headings of: techniques for direct use in graphical display; techniques providing analyzed results for graphical display; techniques providing support for any of the above; and organization of, and prognosis for, relevant techniques. Additionally, there are Appendices which detail the personnel and periods of support, publications sponsored by the project, complete list of technical reports, Ph.D theses which were supported in whole or in part, and a brief list of working papers which were not issued as technical reports. DOE

N85-26216# Los Alamos Scientific Lab., N. Mex.
HARNESSING COMPUTIONAL POWER: DISTRIBUTED COMBINATOR REDUCTION
Randy E. Michelsen and Joseph H. Fasel 1984 6 p refs Presented at the USARO Workshop on Novel Computing Environments, Stanford, Calif., 7-9 Nov. 1984 Submitted for publication
(Contract W-7405-eng-36)
(DE85-005967; IA-UR-85-205; CONF-8411140-2) Avail: NTIS HC A02/MF A01

Much interest has been generated by the notion of combinator graph eduction as a mechanism for the implementation of functional languages. An effort is currently in progress to develop a testbed distributed implementation of a functional language based on this concept. The overall goal is to facilitate the exploitation of implicit parallelism; within this framework, the intention is to use this testbed to evaluate the utility of strategies for combinator graph reduction in a distributed computing system. DOE

N85-26217# California Univ., Livermore. Lawrence Livermore Lab.
SPRING: HELICAL SPRING DESIGN SOFTWARE FOR MICROCOMPUTERS
W. J. Comfort, III 7 Sep. 1984 35 p refs
(Contract W-7405-eng-48)
(DE85-006200; UCID-30200-83-3) Avail: NTIS HC A03/MF A01

SPRING is an interactive microcomputer program that has been developed for use in designing helical compression, extension, and torsion springs. It is designed to provide only those design options for which no design constraints are violated. Five standard spring materials may be chosen. Fatigue models for both torsion and bending are included. Ten examples of results using SPRING are given, followed by the program listing. DOE

N85-26218# California Univ., Livermore. Lawrence Livermore Lab.
GEMINI: A COMPUTER PROGRAM FOR TWO AND THREE DIMENSIONAL LINEAR STATIC AND SEISMIC STRUCTURAL ANALYSIS, CDC 7600 VERSION
R. C. Murray Oct. 1984 156 p refs
(Contract W-7405-eng-48)
(DE85-007496; UCID-20338) Avail: NTIS HC A08/MF A01

GEMINI is a computer program developed for the calculation of static and dynamic response of linear elastic structures by the finite element method. Numerous user requests for extended capability, advances in element technology, and major algorithmic improvements in solution methodology occurring in the last few years have lead to the need and development of GEMINI. This program is intended to replace SAP4 at LINL and to become the focal point here for linear static and seismic structural analysis and future software development in the structures area. GEMINI is written in standard FORTRAN with a modular format. It is written to allow new and complete algorithmic packages such as equation solvers, eigenvalue routines, and modal analysis techniques to be implemented and evaluated conveniently. GEMINI is compatible with the LLNI CDC7600's computers. DOE

N85-26219# Software Systems Technologies, Inc., College Park, Md.
COMPUTER SCIENCE AND TECHNOLOGY: A GUIDE TO PERFORMANCE EVALUATION OF DATABASE SYSTEMS Final Report
D. R. Bernigni, S. B. Yao, and A. R. Hevner Dec. 1984 58 p refs
(PB85-155794; TI85-901187; NBS/SP-500/118; LC-84-601144) Avail: NTIS HC A04/MF A01; alao available SOD HC as SN003-003-0624-7 CSCL 09B

This guide presents a generalized performance analysis methodology for the benchmarking of database systems. The methodology identifies criteria to be utilized in the design, execution, and analysis of a database system benchmark. This generalized methodology can apply to most database system designs. In addition, presenting a wide variety of possible considerations in the design and implementation of the benchmark, this methodology can be applied to the evaluation of either a single system with several configurations, or to the comparison of several systems. Author (GRA)

N85-26220# Environmental Protection Agency, Cincinnati, Ohio. Water Engineering Research Lab.
COMPUTER USE IN RESEARCH FOR DATA ANALYSIS
B. W. Lykins, S. Campbell, and J. C. Ireland Dec. 1984 18 p refs
(PB85-153567; EPA-600/D-84-286) Avail: NTIS HC A02/MF A01 CSCL 13B

Data reported in various ways from several large field scale research projects have been successfully incorporated into a structural format. This format is now required for all new projects that produce data in a machine readable form. The data base structure is general enough in design to accommodate a wide variety of project data scenarios. Remote entry of data from a research site directly into the mainframe at NCC has been in progress for several months. The data handling system is user friendly and versatile. Data reduction of hundreds of thousands of records can be accomplished efficiently. These records can be analyzed, summarized, and reported in a matter of hours. GRA

N85-25641# Joint Publications Research Service, Arlington, Va.
FRENCH FIRM PLANS RECAPTURE OF DOMESTIC CAD/CAM MARKET
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-009) 21 Mar. 1984 p 38-39 Transl. into ENGLISH from Electron. Actualites (Paris), 13 Jan. 1984 p 3 (For primary document see N85-25639 15-31)
Avail: NTIS HC A04/MF A01

N85-25651# Joint Publications Research Service, Arlington, Va.
CRITERIA FOR QUALIFYING FOR FRG FEDERAL CAD/CAM SUBSIDIES
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-014) 4 May 1984 p 52-54 Transl. into ENGLISH from Computerwoche (Munich), 27 Jan. 1984 p 25 (For primary document see N85-25647 15-31)
Avail: NTIS HC A04/MF A01

N85-25654# Joint Publications Research Service, Arlington, Va.
MICROCOMPUTER CONTROLLED IMAGE ACQUISITION SYSTEM
Xiong Xiuxhong and Dai Shengwei *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-013) 1 May 1985 p 45-48 refs Transl. into ENGLISH from Weijisuanji Yingyong (Beijing), v. 5, no. 1, Feb. 1985 p 53-55 (For primary document see N85-25652 15-31)
Avail: NTIS HC A07/MF A01

N85-25822# Joint Publications Research Service, Arlington, Va.
USE OF COMPUTER-AIDED DESIGN IN LARGE-COMPUTER DEVELOPMENT DESCRIBED
Liu Shenquan and Gu Yuan *In its* China Rept: Sci. and Technol. (JPRS-CST-85-010) 17 Apr. 1985 p 48-58 refs Transl. into ENGLISH from Jisuanji Yanjiu Yu Fazhan (Beijing, China), no. 6, Mar. 1983 p 1-7 (For primary document see N85-25819 15-36)
Avail: NTIS HC A06/MF A01

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Includes computer networks.

N85-26221*# Boeing Commercial Airplane Co., Seattle, Wash.
IPAD: INTEGRATED PROGRAMS FOR AEROSPACE-VEHICLE DESIGN Final Report
Ralph E. Miller, Jr. Washington NASA May 1985 29 p
(Contract NAS1-14700)
(NASA-CR-3890; NAS 1.26:3890) Avail: NTIS HC A03/MF A01 CSCL 09B

Early work was performed to apply data base technology in support of the management of engineering data in the design and manufacturing environments. The principal objective of the IPAD project is to develop a computer software system for use in the design of aerospace vehicles. Two prototype systems are created for this purpose. Relational Information Manager (RIM) is a successful commercial product. The IPAD Information Processor (IPIP), a much more sophisticated system, is still under development. E.A.K.

N85-26222# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EVALUATING COMPUTER-COMMUNICATION NETWORKS WITH SIMULATION TECHNIQUES M.S. Thesis
M. P. McEwen Dec. 1984 210 p
(AD-A151852; AFIT/GCS/ENG/84D-16) Avail: NTIS HC A10/MF A01 CSCL 09/2

This thesis proposes a methodology for evaluating computer-communication networks with simulation techniques. The methodology reflects the developmental life-cycle of simulation studies. After the requirements of this methodology are discussed, it is presented as a set of twelve steps. To support the methodology, a package of six programs is designed, implemented, and analyzed. The design proceeds top-down with a functional analysis, system design, and detailed design. The package's implementation allows the analyst to model the data transfers within message or packet-switched value-added networks. The programs support a variety of simulation techniques including preliminary system modeling, optimal-response detection, and sensitivity analysis. These techniques are based on statistics, numerical analysis, and simulation theory. The implementation is analyzed for its time and space requirements with both order of and algebraic expressions. To complete the analysis, the methodology is applied to a sample problem. Future success of the methodology - especially its optimization of guidelines - will depend on the availability of larger computer time resources. GRA

N85-26223# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EFFICIENCY ANALYSIS OF THE ELECTRONIC MAIL SYSTEM (INFOMAIL) ON THE DEFENSE DATA NETWORK M.S. Thesis
K. R. Kavanaugh Dec. 1984 159 p
(AD-A151894; AFIT/GE/ENG/84D-40) Avail: NTIS HC A08/MF A01 CSCL 09/5

The purpose of this thesis was to determine the efficiency of the application of the electronic mail system (INFOMAIL) on the Defense Data Network (DDN) and then conceptualize alternatives which would improve this efficiency. This is the first examination of the overall efficiency of this mail system on the DDN although previous efforts had addressed limitations in components of the system. The highly centralized topology of the INFOMAIL electronic mail system, requires the transmission of inefficient packets, characteristic of a mail session, to traverse a considerable portion of the DDN. Alternative mail system topologies reduce this deficiency by distributing mail functions into network areas closer to the users. The common user I/O device for the electronic mail interaction, the terminal, is inefficient in its use of network transmission bandwidth. Modification of the current terminal/DDN interface would improve this inefficiency particularly when more capable terminals, which could capitalize on this modification, are being deployed. User interaction on the DDN from a network host computer is also inefficient in its use of the networks transmission capability. Alterations in the DDN/network host interface would reduce this inefficiency. GRA

N85-26224# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Computer Science Research.
BACKBONE NETWORK SIMULATIONS: A COMPARATIVE STUDY
Alf Engdal 29 Jun. 1984 37 p refs Prepared in cooperation with Trondheim Univ., Norway
(Contract DE-AC03-76SF-00098)
(DE85-006874; LBL-18132) Avail: NTIS HC A03/MF A01

Extensive work is going on to establish gateways for different LAN and backbone technologies. Backbone part is outlined although many of the models may be equally applicable for local area network (LAN) simulation. The present LEL effort is to plan a, laboratory wide, resource-sharing network that provides communication links among all laboratory facilities. A backbone facility for IAN's will be an essential part of such a network. Performance analysts workbench system was used to do the simulation work. The PAWS is a general tool for simulating computer and communication systems. Experience with the use of the new version of PAWS for computer network simulations is described. DOE

N85-26177# Joint Publications Research Service, Arlington, Va.
PRINCIPLES OF ORGANIZING A REAL-TIME CONTROL SYSTEM
A. F. Verlan and V. V. Galkin *In its* USSR Rept.: Cybernetics, Computers (JPRS-UCC-85-003) 23 Apr. 1985 p 33-39 refs Transl. into ENGLISH from Dokl. Akad. Nauk Ukr. SSR, Ser. A: Fiz.-Mat. i Tekh. Nauki (Kiev), no. 11, Nov. 1984 (For primary document see N85-26174 15-60)
Avail: NTIS HC A06

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N85-26225*# Management and Technical Services Co., Houston, Tex.
THE MODELING AND SIMULATION OF FEEDBACK CONTROL SYSTEMS
Joel I. Leonard 1985 14 p refs
(Contract NAS9-17151)
(NASA-CR-171875; NAS 1.26:171875; TIR-2114-MED-5005) Avail: NTIS HC A02/MF A01 CSCL 09B

A brief description of the principles of mathematical models and their development is given. It should serve as an introduction to those unfamiliar with the topic. G.L.C.

N85-26226# Wisconsin Univ., Madison. Mathematics Research Center.

FREQUENCY/PERIOD ESTIMATION AND ADAPTIVE REJECTION OF PERIODIC DISTURBANCES
D. L. Russel Nov. 1984 59 p refs
(Contract DAAG29-80-C-0041; Grant AF-AFOSR-0088-84)
(AD-A149229; MRC-TSR-2771) Avail: NTIS HC A04/MF A01 CSCL 20/11

A method for suppressing the oscillations of a linear system subject to an external periodic disturbance of fixed, but unknown, period is discussed. The method entails augmentation of the original plant with a compensator and parameter identifier. The near equilibrium dynamics of the resulting system are analyzed and shown to be related to a linear delay equation with infinite delay and periodic coefficients. A corresponding Floquet theory is indicated. A FORTRAN program approximately realizing the period identifier is included and numerical results obtained with this program are graphically displayed and analyzed. Author (GRA)

N85-26227# New Mexico Univ., Albuquerque.
ARTIFICIAL INTELLIGENCE BASED CONTROL OF A SENSOR-DRIVEN MACHINE
R. C. Lennox, G. F. Luger, and R. W. Harrigan (Sandia Labs., Albuquerque, N. Mex.) 1985 7 p refs Presented at the IEEE Conf. on Computer and Commun., Phoenix, Ariz., 20 Mar. 1985
(Contract DE-AC04-76DP-00789)
(DE85-006972; SAND-85-03180; CONF-8503102-1) Avail: NTIS HC A02/MF A01

Control by artificial intelligence is discussed. Four different sections are described: (1) the research area; (2) an overview of the history of planning in artificial intelligence; (3) the representational power of very-high-level computer languages and how this power may be brought to planning in robotics research; and (4) the PROLOG-driven planner for controlling a PUMA arm in solving blocks problems. DOE

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N85-26228*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYSIS OF SPECTRAL OPERATORS IN ONE-DIMENSIONAL DOMAINS Final Report
Yvon Maday Feb. 1985 28 p refs
(Contract NAS1-17070)
(NASA-CR-172573; ICASE-85-17; NAS 1.26:172573) Avail: NTIS HC A03/MF A01 CSCL 12A

Results are proven concerning certain projection operators on the space of all polynomials of degree less than or equal to N with respect to a class of one-dimensional weighted Sobolev spaces. The results are useful in the theory of the approximation of partial differential equations with spectral methods. E.A.K.

N85-26229# Suomalainen Tiedeakatemia, Helsinki (Finland). Dept. of Mathematics.
ANNALS OF THE SCIENTIFIC ACADEMY OF FINLAND, SERIES A. 1: MATHEMATICS, VOLUME 9
Olli Lehto, ed. Hungary 1984 186 p refs
(ISSN-0066-1953) Avail: NTIS HC A09/MF A01

Papers discussing various topics in function theory and abstract harmonic analysis are presented. Topic areas include harmonic majorants, harmonic univalent functions, meromorphic functions, entire functions, Mobius groups, and iteration of exponential functions. For individual titles, see N85-26230 through N85-26243.

N85-26230# York Univ. (England). Dept. of Mathematics.
HARMONIC UNIVALENT FUNCTIONS
J. Clunie and T. Sheil-Small *In* Suomalainen Tiedeakatemia Ann. of the Sci. Acad. of Finland, Ser. A, 1: Math., Vol. 9 1984 p 3-26 refs (For primary document see N85-26229 15-64)
Avail: NTIS HC A09/MF A01

The characteristics of harmonic univalent functions are discussed and it is shown that the analytic part of a convex mapping is univalent. In addition, the sharp coefficient bounds are obtained for convex functions of particular normalized classes. A number of sharp results on the special classes of convex, close-to-convex, and typically real functions are given. M.G.

N85-26231# Illinois Univ., Urbana-Champaign. Dept. of Mathematics.
FOURIER-STIELTJES COEFFICIENTS AND CONTINUATION OF FUNCTIONS
R. Kaufman *In* Suomalainen Tiedeakatemia Ann. of the Sci. Acad. of Finland, Ser. A, 1: Math., Vol. 9 1984 p 27-31 refs (For primary document see N85-26229 15-64)
Avail: NTIS HC A09/MF A01

Two classical problems of continuation for certain functions of a complex variables are considered. In the first problem f is continuous in R sup 2 and analytic outside a closed set E; E is removable for this problem if it is always true that f is entire. In the second problem f is a homeomorphism of the extended plane, which is K-quasiconformal outside E; E is removable if f is always quasiconformal in the extended plane. For both problems there is a best-possible theorem. E is removable if it is of sigma-finite length. In each problem, a product set FX(0,1) is non-removable precisely when F is uncountable. The task is to find nonremovable sets contained in FX(0,1), not of the product type nor even approximately so. M.G.

N85-26232# Helsinki Univ. (Finland). Dept. of Mathematics.
ON MEROMORPHIC FUNCTIONS CONTINUOUS ON THE STOILOW BOUNDARY
Pentti Jarvi *In* Suomalainen Tiedeakatemia Ann. of the Sci. Acad. of Finland, Ser. A, 1: Math., Vol. 9 1984 p 33-48 refs (For primary document see N85-26229 15-64)
Avail: NTIS HC A09/MF A01

Meromorphic functions on an open Riemann surface which extended continuously to the Stoilow ideal boundary (MC-functions) are studied. The main concern is how to classify the boundary elements into essential and inessential points from the point of view of MC-functions. Topological properties of MC-functions are reviewed. The close relationship between the openness of extended functions and their covering properties is demonstrated. A definition for removable and essential boundary points is then proposed. It turns out that removability can be characterized as well in topological as in algebraic and analytic terms: via the openness of extended functions, via the field property of MC-functions and via a certain function-theoretic null-class, respectively. As an application, a solution to a problem proposed by Ozawa, concerning certain classification principles for Riemann surfaces is given. Conditions are given, in terms of cluster sets attached to the ideal boundary, which guarantee continuous extension of the functions involved. M.G.

N85-26233# Imperial Coll. of Science and Technology, London (England). Dept. of Mathematics.
ITERATION OF EXPONENTIAL FUNCTIONS
I. N. Baker and P. J. Rippon (Open Univ.) *In* Suomalainen Tiedeakatemia Ann. of the Sci. Acad. of Finland, Ser. A, 1: Math., Vol. 9 1984 p 49-77 refs (For primary document see N85-26229 15-64)
Avail: NTIS HC A09/MF A01

For any entire or rational function f in the complex plane define the sequence of iterates (F sup N), N is an element of N, by F sup 0(Z) is identical with Z, F sup N = F sup N-1 0 F, N> or = 1 is the complement of the maximal open set C(f) in which f sup N) is a normal family. The Fatou-Julia theory of iteration attempts to analyze the way in which F(f) divides the plane and to consider the various possible limit functions for convergent subsequences of (f sup n) in the components of C(f). The case when F(z)=E sup AZ, and A is an arbitrary complex parameter, is studied. M.G.

N85-26234# Helsinki Univ. (Finland). Dept. of Mathematics.
ON THE LENGTH OF ASYMPTOTIC PATHS OF MEROMORPHIC

FUNCTIONS OF ORDER ZERO
Sakari Toppila *In* Suomalainen Tiedeakatemia Ann. of the Sci. Acad. of Finland, Ser. A, 1: Math., Vol. 9 1984 p 79-87 refs (For primary document see N85-26229 15-64)
Avail: NTIS HC A09/MF A01

The following problem of Erdos is considered: suppose that F is an entire function of finite order and gamma is a locally rectifiable path on which F(Z) approaches infinity. Let L(R, gamma) be the length of gamma in the absolute value of Z < or = R. Find a path for which L(R, gamma) grows as slowly as possible and estimate L(R, gamma) in terms of M(R,F). Further, determine whether a path gamma can be found for which L(R, gamma)=0(R) as R approaches infinity when F has zero order or more generally, finite order. M.G.

N85-26235# Harvard Univ., Cambridge, Mass. Dept. of Mathematics.
OLD AND NEW IN MOEBIUS GROUPS
Lars V. Ahlfors *In* Suomalainen Tiedeakatemia Ann. of the Sci. Acad. of Finland, Ser. A, 1: Math., Vol. 9 1984 p 93-105 refs (For primary document see N85-26229 15-64)
Avail: NTIS HC A09/MF A01

The use of Clifford numbers in connection with Mobius transformations is discussed. An elementary proof of Mostow's rigidity theorem is given. M.G.

N85-26236# Uppsala Univ. (Sweden). Dept. of Mathematics.
A PROBLEM OF BURKHOLDER AND THE EXISTENCE OF HARMONIC MAJORANTS OF THE ABSOLUTE VALUE OF x SUP p IN CERTAIN DOMAINS IN R SUP d
Matis Essen and Kersti Haliste (Umea Univ.) *In* Suomalainen Tiedeakatemia Ann. of the Sci. Acad. of Finland, Ser. A, 1: Math., Vol. 9 1984 p 107-116 refs (For primary document see N85-26229 15-64)
Avail: NTIS HC A09/MF A01

Let R sub d (where d > or = 2) denote a d-dimensional Euclidean space with x = (x sub 1, x sub 2, ..., x sub d), /x/ = (the sum to d terms (k=1) x sup 2 sub k) sup 1/2 and x sub 1 = /x/ cos phi, 0 < or = phi < or = pi. Let delta > 0 be given and consider the approximately conical domain T = [: /x/ > 1, 0 < or = phi < arc tan (delta log /x/)]. The problem is to determine for what values of delta does /x/ have a harmonic majorant in T. M.G.

N85-26237# Umea Univ. (Sweden). Dept. of Mathematics.
SOME ESTIMATES OF HARMONIC MAJORANTS
Kersti Haliste *In* Suomalainen Tiedeakatemia Ann. of the Sci. Acad. of Finland, Ser. A, 1: Math., Vol. 9 1984 p 117-124 refs (For primary document see N85-26229 15-64)
Avail: NTIS HC A09/MF A01

The problem of the harmonic majorization of a given subharmonic function in an unbounded domain in R sup d involves the Dirichlet problem with the given boundary values and hence in use of harmonic measure. Let tau denote the exit time from D (an open connected set in R sup d) of a Brownian motion, starting at zero time from a point x in D. Burkholder proved (for 0 < p < infinity) that the expectation E(sub x)tau(sup p/2) is finite if and only if /x/ sup p has a least harmonic majorant u(x) in D. One can ask the question whether the order of magnitude of u(x) and hence that of E(sub x)tau(sup p/2) can be greater than that of /x/ sup p. An estimate of the type -- u(x) < or = C/x/ sup p log/x/, /x/ > or = gamma > 1 -- is considered. The majorization of some other subharmonic functions is also treated. M.G.

N85-26238# Joensuu Univ. (Finland). Dept. of Mathematics.
ON THE BOUNDARY BEHAVIOUR OF A ROTATION AUTOMORPHIC FUNCTION WITH FINITE SPHERICAL DIRICHLET INTEGRAL
Rauno Aulaskari *In* Suomalainen Tiedeakatemia Ann. of the Sci. Acad. of Finland, Ser. A, 1: Math., Vol. 9 1984 p 125-131 refs (For primary document see N85-26229 15-64)
Avail: NTIS HC A09/MF A01

In a previous paper a rotation automorphic function, f, was defined with respect to some Fuchian group gamma. The function f, meromorphic in the unit disc D, was said to be rotation automorphic with respect to gamma acting on D if it satisfied the equation f(T(z)) = S sub T (f(z)), where T is an element of gamma and S sub T is a rotation of the Riemann sphere C. The boundary behavior of a rotation automorphic function f is considered which satisfies the condition - integral integral (sub F) f* (z)sup 2 d sigma(sub z) < infinity. M.G.

N85-26239# Helsinki Univ. (Finland). Dept. of Mathematics.
REMARKS OF THE MAXIMAL DILATATION OF THE BEURLING-AHLFORS EXTENSION
Matti Lehtinen *In* Suomlainen Tiedeakatemia Ann. of the Sci. Acad. of Finland, Ser. A, 1: Math., Vol. 9 1984 p 133-139 refs (For primary document see N85-26229 15-64)
Avail: NTIS HC A09/MF A01

A increasing continuous function h defined on an interval I, which can be the entire real line R sup 1, is q-quasisymmetric if - q(sup-1) < or = (h(x + t) - (x))/(h(x) - h(x - t)) < or = q - for all x and all t >0 such that [x - t, x + t] is a subset of I. Implications of this condition on the maximal dilatation K(f sub h,1) are examined. M.G.

N85-26240# Helsinki Univ. of Technology, Espoo (Finland). Inst. of Mathematics.
A REMARK ON THE CONFORMAL CAPACITY OF GROETZSCH'S CONDENSER IN SPACE
Peter Lindqvist *In* Suomalainen Tiedeakatemia Ann. of the Sci. Acad. of Finland, Ser. A, 1: Math., Vol. 9 1984 p 141-144 refs (For primary document see N85-26229 15-64)
Avail: NTIS HC A09/MF A01

Grotzsch's condenser is a well-known extremal condenser in the complex plane and the corresponding configuration in space has certain applications e.g. for the theory of quasiconformal mappings. A difficult question has been how to achieve natural upper bounds for the conformal capacity nu (sub n) (r) as r approaches 1-0. An estimate given by Anderson is proved by elementary calculus and a more adequate means of achieving the estimate is presented. M.G.

N85-26241# Kansas State Univ., Manhattan. Dept. of Mathematics.
ENTIRE FUNCTIONS WITH SPIRAL LIMITS
R. B. Burckel and Sadahiro Saeki *In* Suomalainen Tiedeakatemia Ann. of the Sci. Acad. of Finland, Ser. A, 1: Math., Vol. 9 1984 p 145-151 refs (For primary document see N85-26229 15-64)
Avail: NTIS HC A09/MF A01

An entire function with spiral limits was constructed. The limits were many finitely preassigned polynomials. The method employed uses the well known technique of shoving poles to infinity. G.L.C.

N85-26242# Helsinki Univ. (Finland). Dept. of Mathematics.
EXTENSION OF EMBEDDINGS CLOSE TO ISOMETRIES OR SIMILARITIES
P. Tukia and J. Vaisala *In* Suomalainen Tiedeakatemia Ann. of the Sci. Acad. of Finland, Ser. A, 1: Math., Vol. 9 1984 p 153-175 refs (For primary document see N85-26229 15-64)
Avail: NTIS HC A09/MF A01

Let X and Y be metric spaces. The distance between points a, b in either space is written as the absolute value of the quantity (A-B). A map f: X onto Y is L-bilipschitz if it satisfies the double inequality: (absolute value of the quantity (x-y))/L < or = F(X)-F(Y) < or = L multiplex by the absoulute value of (X-Y). If the right hand inequality is satisfied, F is said to be L-Lipschitz. The smallest such LI is then called the Upschitz constant of F and denoted lip F. A 1-bilipschitz map is an isometry. If A is contained within R sup n, an isometry f: A onto R sup n is always the restriction of a unique affine isometry F sub 1: T(A) onto R sup n. If E is a vector subspace of R sup n and if f: E onto R sup n is an isometry with f(0)=0, f is an orthogonal map. A sense preserving orthogonal map f: R sup n onto R sup n is called a rotation. G.L.C.

N85-26243# Helsinki Univ. (Finland). Dept. of Mathematics.
ON FUNCTIONS WITH A FINITE OR LOCALLY BOUNDED DIRICHLET INTEGRAL
Matti Vuorinen *In* Suomalainen Tiedeakatemia Ann. of the Sci. Acad. of Finland, Ser. A, 1: Math., Vol. 9 1984 p 177-193 refs (For primary document see N85-26229 15-64)
Avail: NTIS HC A09/MF A01

The modulus of a curve family is an effective tool in the geometric function theory and in the theory of quasiconformal and quasirregular mappings. The aim is to show that the modulus method applies to the study of real-valued functions as well. An approach to the theory of Dirichlet finite functions, which is based on the well-known connection between the Dirichlet integral of an ACL sup n function u and the modulus of the family curves joining given level sets of u is employed here. In this approach the modulus method has a role similar to that of the length-area principle. G.L.C.

N85-26244# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THEORY AND APPLICATIONS OF STATE ESTIMATION. NRIMS SUMMER SEMINAR SERIES
M. Pachter, ed. and Y. Yavin, ed. Jan. 1984 199 p refs Seminar held in Pretoria, 1-3 Feb. 1984
(CSIR-SWISK-37; ISBN-0-7988-2964-8) Avail: NTIS HC A09/MF A01

Linear and nonlinear state estimation problems are discussed. Specific topics include Kalman filters, truncated nonlinear filters, state estimation with interrupted observations, tracking filters, linear filtering with non-Gaussian initial conditions, and Kalman filtering and exponential smoothing in economics. For individual titles, see N85-26245 through N85-26254.

N85-26245# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
NONLINEAR ESTIMATION
Y. Yavin *In its* Theory and Appl. of State Estimation. NRIMS Summer Seminar Ser. Jan. 1984 p 1-14 refs (For primary document see N85-26244 15-64)
Avail: NTIS HC A09/MF A01

The nonlinear state estimation problem with continuous in-time measurements is formulated and the celebrated Fujisaki-Kallian-pur-Kunita (F-K-K) filtering formula is given. Equations for the Kalman-Bucy filter are derived and examples of nonlinear stochastic systems and Markov chains are considered. M.G.

N85-26246# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THE KALMAN FILTER
M. Pachter *In its* Theory and Appl. of State Estimation. NRIMS Summer Seminar Ser. Jan. 1984 p 15-25 refs (For primary document see N85-26244 15-64)
Avail: NTIS HC A09/MF A01

An elementary presentation and derivation of the Kalman filter is given. The problem of extracting information on the state of a linar system from the system's output measurements is considered. Disturbances are present both in the system itself and in the process of measuring the output. In order to avoid the difficulties germane to the notion of a continuous time stochastic process, the discussion is confined to a discrete time setting; this, and the hypotheses of linearity and Gaussian noise, greatly facilitate the presentation. M.G.

N85-26247# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
LINEAR FILTERING WITH NON-GAUSSIAN INITIAL CONDITIONS
Y. Yavin *In its* Theory and Appl. of State Estimation. NRIMS Summer Seminar Ser. Jan. 1984 p 26-41 refs (For primary document see N85-26244 15-64)
Avail: NTIS HC A09/MF A01

Filter equations for linear systems with non-Gaussian initial distributions are presented and an algorithm for their numerical implementation is described. The application of adaptive estimation via parallel processing is discussed and results of numerical experimentation using hypothetical parameter values are given. M.G.

N85-26248# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
KALMAN FILTERING AND EXPONENTIAL SMOOTHING IN ECONOMICS
M. Pachter *In its* Theory and Appl. of State Estimation. NRIMS Summer Seminar Ser. Jan. 1984 p 42-65 refs (For primary document see N85-26244 15-64)
Avail: NTIS HC A09/MF A01

In economics the so called exponential smoothing models are rather common and involve the forecasting of time series associated with inventory levels, sales records, the demand for spare parts, etc. A time series model that is concerned with the problem of forecasting in the presence of aggregated information available from many sources is presented. An objective point of view is adopted which hinges on the Kalman filter approach (to forecasting) advocated in the control literature. M.G.

N85-26249# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
TRUNCATED NONLINEAR FILTERS
Y. Yavin *In its* Theory and Appl. of State Estimation. NRIMS Summer Seminar Ser. Jan. 1984 p 66-77 refs (For primary document see N85-26244 15-64)
Avail: NTIS HC A09/MF A01

Consider the nonlinear stochastic system given by dx(t) - f(x(t))dt + G(x(t))dW(t), t > 0, x(t) is an element of R(sup m); and dy(t) = g(x(t))dt + gamma dv(t), t > 0, y(t) is an element of R(sup p). Equations are obtained for a finite dimensional recursive filter by using Taylor series expansions of f, g and G, and truncating these expansions by neglecting third and higher order conditional central moments of zeta. M.G.

N85-26250# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
SOME ASPECTS OF DECENTRALIZED KALMAN FILTERING
M. Pachter *In its* Theory and Appl. of State Estimation. NRIMS Summer Seminar Ser. Jan. 1984 p 78-98 (For primary document see N85-26244 15-64)
Avail: NTIS HC A09/MF A01

The occurrence of decentralized and, more specifically, hierarchical structures in dynamical systems is mainly dictated by the pertinent information pattern, rather than the geographical dispersion of a large scale system. Admittedly, the actual system structure will eventually influence the prevalent information pattern, but ultimately it is the available set of measurements of the endegeneous variables and the instrument variables that determines the information pattern in the system. Thus, it is actually the estimation problem that should first attract attention when dealing with the decentralized control problem. The problem of decentralized estimation arises naturally in a large scale system setting, and it is believed that the analysis of decentralized estimation is in fact a prerequisite for a decentralized control analysis of large scale systems. The hierarchical estimation problem is discussed. M.G.

N85-26251# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
STATE ESTIMATION WITH INTERRUPTED OBSERVATIONS
Y. Yavin *In its* Theory and Appl. of State Estimation. NRIMS Summer Seminar Ser. Jan. 1984 p 99-115 refs (For primary document see N85-26244 15-64)
Avail: NTIS HC A09/MF A01

A truncated finite dimensional filter is introduced for state estimation of continuous time systems with interrupted observations. Results of numerical experimentation are presented and discussed. M.G.

N85-26252# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
TRACKING FILTERS
M. Pachter *In its* Theory and Appl. of State Estimation. NRIMS Summer Seminar Ser. Jan. 1984 p 116-134 refs (For primary document see N85-26244 15-64)
Avail: NTIS HC A09/MF A01

The tracking filter problem is analyzed with consideration given to modelling the encounter as a stochastic differential (or difference) game. A restricted class of problems is addressed wherein the system input is unknown to the observer. The example of a combined range finder/Doppler radar speed trap is discussed along with the situation of tracking a maneuvering target in a plane. M.G.

N85-26253# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
ESTIMATION OF MANEUVERING TARGETS
Y. Yavin *In its* Theory and Appl. of State Estimation. NRIMS Summer Seminar Ser. Jan. 1984 p 135-141 refs (For primary document see N85-26244 15-64)
Avail: NTIS HC A09/MF A01

The determination of the position and velocity of a maneuvering target using radar observations is a problem in nonlinear estimation theory. During the past decade much effort has been spent in the development of digital filtering algorithms for tracking airborne maneuvering targets. A version of the estimation problem considered by Moose, Vanlandingham, and McCabe is discussed. Minimum variance filter equations are developed and results of numerical experimentation are given. M.G.

N85-26254# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
APPLICATIONS OF KALMAN FILTERING AND RECURSIVE LEAST-SQUARES IN RIVER FLOW MODELLING
G. G. S. Pegram and P. G. Kunst *In its* Theory and Appl. of State Estimation. NRIMS Summer Seminar Ser. Jan. 1984 p 142-191 refs (For primary document see N85-26244 15-64)
Avail: NTIS HC A09/MF A01

A model which combines the traditional black box type of model with a purely physically based model is employed. It is a linear model that is built up from series and parallel combinations of linear reservoirs. The objective is to obtain a parsimonious set of optimized model parameters that will give a faithful reproduction of the original streamflow record, using the effective input computed from that record. The method by which the parameters are optimized was originally adopted from Stretch (1980) who used an extended Kalman filter (EKF) technique. Results show that even though the EKF is a good predictor corretor it can not be used as a parameter estimator in this particular application. An alternative parameter estimation technique is used. The Marquardt algorithm is then developed into a modified recursive ordinary least squares (ROLS) parameter estimator that is tailored to the specific needs of this study. M.G.

N85-26255*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
NUMERICAL SOLUTIONS OF 3-DIMENSIONAL NAVIER-STOKES EQUATIONS FOR CLOSED BLUFF-BODIES Progress Report
Jamshid S. Abolhassani and S. N. Tiwari Apr. 1985 19 p refs (Grant NCC1-68)
(NASA-CR-175755; NAS 1.26:175755) Avail: NTIS HC A02/MF A01 CSCL 12A

The Navier-Stokes equations are solved numerically. These equations are unsteady, compressible, viscous, and three-dimensional without neglecting any terms. The time dependency of the governing equations allows the solution to progress naturally for an arbitrary initial guess to an asymptotic steady state, if one exists. The equations are transformed from physical coordinates to the computational coordinates, allowing the solution of the governing equations in a rectangular parallelepiped domain. The equations are solved by the MacCormack time-split technique which is vectorized and programmed to run on the CDc VPS 32 computer. The codes are written in 32-bit (half word) FORTRAN, which provides an approximate factor of two decreasing in computational time and doubles the memory size compared to the 54-bit word size. G.L.C.

N85-26256# Loughborough Univ. of Technology (England). Dept. of Mathematics.
CENSORED OBSERVATIONS, REPEATED MEASURES AND MIXED EFFECTS MODELS: AN APPROACH USING THE EM ALGORITHM AND NORMAL ERRORS
A. N. Pettitt Oct. 1984 24 p refs
(Mathematics-Research-183) Avail: NTIS HC A02/MF A01

Maximum likelihood estimation of a vector regression parameter and variance components is considered for the mixed effects model when observations are right censored. A general scheme of estimation is given using the EM algorithm and detailed results found for the model with between and within block variation. This model is applied to the logarithms of survival times from a repeated measures design. Author

N85-26257# Birmingham Univ. (England). Dept. of Statistics.
HIGHER ORDER RESIDUAL ANALYSIS FOR NONLINEAR TIME SERIES WITH AUTOREGRESSIVE CORRELATION STRUCTURES
A. J. Lawrance and P. A. W. Lewis 25 Sep. 1984 29 p refs
(AD-A149232; NPS55-84-022) Avail: NTIS HC A03/MF A01 CSCL 12/1

Nonlinear time series whose second order autocorrelations satisfy autoregressive Yule-Walker equations are considered. The usual linear residuals are then uncorrelated, but not independent, as would be the case for linear autoregressive processes. Two such types of nonlinear model are treated in some detail; random coefficient autoregression and multiplicative autoregression. The proposed analysis involves crosscorrelation of the usual linear residuals and their squares. This function is obtained for the two types of models considered, and allows differentiation between models with the same autocorrelation structure in the same class. For the random coefficient models it is shown that one side of the crosscorrelation function is zero, giving a useful signature of these processes. The non-zero features of the crosscorrelations are informative of the higher order dependence structure. In applications this residual analysis requires only standard statistical calculations, and extends rather than replaces the usual second order analysis. GRA

N85-26258# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
ENHANCED THERMAL-STRUCTURAL ANALYSIS BY INTEGRATED FINITE ELEMENTS Final Report, 1 Jun. - 31 Dec. 1982
E. A. Thornton and P. Dechaumphai Wright-Patterson AFB, Ohio AFWAL Oct. 1984 80 p
(Contract F33615-82-K-3219)
(AD-A151103; AFWAL-TR-84-3058) Avail: NTIS HC A05/MF A01 CSCL 12/1

An integrated finite element approach for enhanced thermal structural analysis is presented. The approach employs a common nodal discretization and seeks improvements in the accuracy by new hierarchical finite element formulations for the thermal and structural analyses. The effectiveness of the integrated approach is assessed for four applications with two dimensional elements. Comparative solutions show the integrated approach provides improvements in the accuracy of temperatures, displacements and thermal stresses. The applications demonstrate the practical importance of having freedom to refine each analysis independently while maintaining a common discretization. The study demonstrates that the hierarchical finite element formulations offers significant potential for the development of a general method integrated thermal-structural analysis. GRA

N85-26259# Maryland Univ., College Park. Dept. of Aerospace Engineering.

DEVELOPMENT OF A DYNAMIC FINITE ELEMENT MODEL FOR UNRESTRAINED FLEXIBLE STRUCTURES Final Report, 1 Sep. 1982 - 30 Jun. 1984
E. R. Christensen and S. W. Lee Oct. 1984 145 p
(Grant AF-AFOSR-0296-82)
(AD-A151176; AFOSR-85-0183TR) Avail: NTIS HC A07/MF A01 CSCL 12/1

An efficient finite element model and solution technique have been developed for the analysis of unrestrained flexible structures undergoing large elastic deformations coupled with gross nonsteady translational and rotational motions with respect to an inertial reference frame. The nonlinear coupled differential equations resulting from the finite element approximation are integrated timewise using an implicit-explicit split operator numerical integration scheme which treats the stability sensitive terms of the equation implicitly while the rest of the equation is treated explicitly. The motion of simple spacecraft structures consisting of flexible beams attached to rigid masses and including the effect of control forces has been studied using three-node eighteen-degree-of-freedom three dimensional beam elements based on the total Lagrangian description. GRA

N85-26260# Pittsburgh Univ., Pa. Dept. of Mathematics and Statistics.
VORTEX DYNAMICS Final Report, 1 Mar. 1982 - 30 Sep. 1984
N. J. Zabusky 15 Dec. 1984 9 p
(Contract DAAG29-82-K-0067)
(AD-A151278; ARO-18452.7-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

New algorithmic, mathematical and simulation results for the 2D Euler equations have been obtained. The contour dynamical algorithm for piecewise-constant vorticity regions (FAVOR's) has been improved and applied to finding accurate steady-state (V-states) and dynamical evolutions. The boundary of only one region and at which the tangent angle is discontinuous then the difference in tangent angles can be only by 90 degrees (a corner) or 180 degrees (a cusp). The analytical behavior of doubly and triply connected rotating V-states is also investigated. GRA

N85-26261# Texas Univ., Austin. Dept. of Computer Sciences.
[CONSTRUCTING UNIFYING FRAMEWORKS FOR THE STUDY OF DISTRIBUTED SYSTEM AND ALGORITHMS] Annual Report, 15 Jun. 1983 - 14 Jun. 1984
K. M. Chandy and J. Misra Dec. 1984 148 p
(Grant AF-AFOSR-0205-81)
(AD-A151287; AFOSR-85-0200TR) Avail: NTIS HC A07/MF A01 CSCL 12/1

Contents: Paradigms for Distributed Computing; Distributed Simulated; Processor Queueing Disciplines in Distributed Systems; The Effect of Queueing Disciplines on Response Times in Distributed Systems; The Drinking Philosopher's Problem; Distributed Snapshots: Determining Global States of Distributed Systems. GRA

N85-26262# Naval Postgraduate School, Monterey, Calif.
INTERMEDIATE TERM FORECASTING TECHNIQUES FOR MANAGEMENT M.S. Thesis
D. L. Herring Jun. 1984 85 p
(AD-A151370) Avail: NTIS HC A05/MF A01 CSCL 12/1

In this thesis autoregressive Integrated Moving Average (ARIMA) forecasts are made for the prices of a variety of commodities one year into the future in an attempt to determine if improved budget accuracy is possible for small businesses dependent upon commodities for the production of goods or services. An average forecast error of less than seven percent is obtained using commonly available ARIMA computer software employable on inexpensive microcomputers. It is concluded small businesses can affordably obtain more accurate commodity price budgets through the use of ARIMA forecasts. Author (GRA)

N85-26263# . Ford Aerospace and Communications Corp., Palo Alto, Calif. Western Development Lab. Div.
ON FAILURE MODELING, REVISED
A. J. Lemoine and M. L. Wenocur Sep. 1984 18 p
(Contracts N00014-82-C-0620; DAAG29-82-K-0151)
(AD-A151411; WDL-TR10147-Rev) Avail: NTIS HC A02/MF A01 CSCL 12/1

A promising approach to failure modeling, in particular to developing failure-time distributions, is discussed. Under this approach, system state or wear and tear is modeled by an appropriately chosen random process, eg, a diffusion process; and the occurrences of fatal shocks are modeled by a Poisson process whose rate function is state dependent. The system is said to fail when either wear and tear accumulates beyond an acceptable or safe level or a fatal shock occurs. This approach has significant merit. First it provides revealing new insights into most of the famous and frequently used lifetime distributions in reliability theory. Moreover, it suggests intuitively appealing ways for enhancing those standard models. Indeed, this approach provides a means of representing the underlying dynamics inherent in failure processes. Reasonable postulates for the dynamics of failure should lend credence to prediction and estimation of reliability, maintainability, and availability. In other words, accuracy of representation could lead to better, more reliable prediction of failure. GRA

N85-26264# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mathematics.
UNIQUENESS AND STABILITY IN NONLINEAR ELASTICITY AND VISCOELASTICITY Final Report, 19 Oct. 1981 - 18 Oct. 1984
M. E. Gurtin 14 Jan. 1985 14 p
(Contract DAAG29-82-K-0002)
(AD-A151470; ARO-18463.13-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report contains a summary of research concerning finite elasticity, phase transitions, viscoelasticity, viscoplasticity, plasticity, degenerate parabolic equations, and free boundaries. GRA

N85-26265# Naval Underwater Systems Center, New London, Conn.
RECENT PROGRESS IN THE DEVELOPMENT AND APPLICATION OF THE PARABOLIC EQUATION
P. D. Scully-Power and D. Lee 7 May 1984 126 p
(AD-A151475; NUSC-TD-7145) Avail: NTIS HC A07/MF A01 CSCL 12/1

Four university professors, sponsored jointly by the Navy-ASEE Summer Faculty Research Program, the Naval Underwater Systems Center, and the Office of Naval Research, chose to visit NUSC during the summer of 1983 to participate in both the NUSC independent research project, Finite Difference Solutions to Acoustic Wave Propagation, and the ONR-sponsored research project, Computational Acoustics. Research was performed jointly by the authors of this document. This technical document reports significant technical progress attained during the visit. Time did not permit the authors to carry out the necessary computations during the summer; however, as a continuing joint effort, computational results will be produced later to verify the validity of the theoretical developments. Mathematical, physical, and computational contributions to the underwater acoustic wave propagations have been made due to combined multiple efforts among the authors presented here. These accomplishments not only enhance the PE capability by extending the solution to three-dimensional problems, but the work can be extended to handle acoustic wave propagations in elastic media. It is necessary that a complete numerical computation be performed to confirm the validity of these theoretical and computational developments. GRA

N85-26266# Naval Postgraduate School, Monterey, Calif.
EQUILIBRIUM SOLUTIONS, STABILITIES AND DYNAMICS OF LANCHESTER'S EQUATIONS WITH OPTIMIZATION OF INITIAL FORCE COMMITMENTS M.S. Thesis
A. B. Ning Sep. 1984 129 p
(AD-A151510) Avail: NTIS HC A07/MF A01 CSCL 12/1

Generalized Lanchester-type differential equations are used to study combat processes. This system of non-linear equations has

multiple equilibrium solutions which can be determined by a numerical technique called the Continuation Method. Useful properties pertaining to neighborhood stability are derived by considering the lowest-dimensional (1*1) problem. A new set of parameters based on the system asymptotes is defined and used to characterize stability. System dynamics are investigated using phase trajectories which are found to depend on the domains of attraction and stabilities of surrounding equilibria. The effect of varying initial force levels (X,Y) is studied by calculating an objective function which is the difference of the losses at the end of a multistage battle simulation. Based on the minimax theorem, a set of mixed strategies for (X, Y) can be found. For highly unstable warfare with large war resources, instability can be used to influence battle outcome. Author (GRA)

N85-26267# Yale Univ., New Haven, Conn. Dept. of Computer Science.

COMMUNICATION COMPLEXITY OF THE GAUSSIAN ELIMINATION ALGORITHM ON MULTIPROCESSORS

Y. Saad Jan. 1985 19 p
(Contract N00014-82-K-0184)
(AD-A151891; YALEU/DCS/RR-348) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper proposes a few lower bounds for communication complexity of the Gaussian Elimination algorithm on multiprocessors. Three types of architectures are considered: a bus architecture, a nearest neighbor ring network and a nearest neighbor grid network. GRA

N85-26268# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

INVESTIGATION OF THE NUMERICAL METHOD OF MOMENTS FOR DIGITAL COMPUTER DETERMINATION OF DIFFERENTIAL EQUATIONS M.S. Thesis

D. E. Oyler Dec. 1984 91 p
(AD-A151896; AFIT/GEP/PH/84D-7) Avail: NTIS HC A05/MF A01 CSCL 12/1

The purpose of this thesis was to determine the feasibility of using the method of weighted residuals to obtain approximations to the discrete Green's function, or analogs to it. The weighted residual methods of Galerkin and collocation, as well as the finite difference method were programmed of a Kaypro II micro-computer in Microsoft Basic. These programs were used to generate approximations to the one- and two-dimensional Poisson's equation, The two-dimensional case was restricted to the geometry of a unit square. Various inhomogeneity terms were used to obtain approximate solutions to the discrete Green's functions or their analogs. The results were compared with the analytical values at various interior nodal points on the mesh. The average percent error for the approximations were reported for each case as the number of interior nodal points was increased. The areas of consideration were the rate of convergence to the analytical solution, the amount of time it took to run each program, and the accuracy of the approximate solutions. The results of this study indicate that the Green's functions or analogs obtained are valid approximations to the discrete Green's functions or analogs obtained are valid approximations to the discrete Green's functions. The method of weighted residuals proved to be very sensitive to the choice of basis functions, resulting in ill-conditioned matrices in some instances. Author (GRA)

N85-26269# Naval Postgraduate School, Monterey, Calif.

SOLVING SET COVERING PROBLEMS USING HEURISTICS WITH BRANCH AND BOUND M.S. Thesis

K. J. Nam Sep. 1984 58 p
(AD-A151905) Avail: NTIS HC A04/MF A01 CSCL 12/1

An algorithm based on simple heuristics is presented for an important class of all-binary integer linear programs known as the set covering problem. In spite of its very special form, the set covering problem has many practical applications. Optimal solutions to problems derived from these applications are difficult to obtain using known methods. Various solution techniques are investigated based on heuristic algorithms that obtain upper and lower bounds on the optimal solution value together with branch and bound enumeration. These solution techniques are effective on some problems. Computational results are reported for several large-scale real-world problems and several artificial problems. GRA

N85-26270# California Inst. of Tech., Pasadena. Dept. of Applied Mathematics.

MATHEMATICAL SOFTWARE FOR HYPERBOLIC EQUATIONS AND TWO POINT BOUNDARY VALUE PROBLEMS Final Report, 30 Sep. 1982 - 29 Feb. 1984

H. B. Keller and H. O. Kreiss Feb. 1985 5 p
(Grant AF-AFOSR-0321-82)
(AD-A151982; AFOSR-85-0272TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document reports that the original software development program has been extended in several directions: adaptive mesh generation, multigrid methods, singular perturbation problems. A crude code generator for very general two point boundary value problems has been activated. Extensions in all these directions are under way. Author (GRA)

N85-26271# Yale Univ., New Haven, Conn. Dept. of Computer Science.

A STABILITY ANALYSIS OF INCOMPLETE LU FACTORIZATIONS

H. C. Elman Feb. 1985 35 p
(Contract N00014-82-K-0814)
(AD-A152058; YALEU/DCS/RR-365) Avail: NTIS HC A03/MF A01 CSCL 12/1

The combination of iterative methods with preconditionings based on incomplete LU factorizations constitutes an effective class of methods for solving the sparse linear systems arising from the discretization of elliptic partial differential equations. In this paper, we show that there are some settings in which the incomplete LU preconditioners are not effective, and we demonstrate that their poor performance is due to numerical instability. Our analysis consists of an analytic and numerical study of a sample two-dimensional non-self-adjoint elliptic problem discretized by several finite difference schemes. Author (GRA)

N85-26272# Wisconsin Univ., Madison. Mathematics Research Center.

A NEW APPROACH TO QUEER DIFFERENTIAL EQUATIONS

Peter Laurence and E. W. Stredulinsky Oct. 1984 33 p refs
(Contracts DAAG29-80-C-0041; DE-AC02-79ER-03077; Grant NSF MCS-82-10950)
(AD-A149321; MRC-TSR-2764) Avail: NTIS HC A03/MF A01 CSCL 12/1

Queer differential equations first arose in the work of Harold Grad on controlled thermonuclear fusion. They relate in particular to models for the slow adiabatic evaluation and resistive diffusion of a plasma. They are queer in that they share aspects of partial, ordinary and functional differential equations. A new way of thinking of these equations by relating them to free boundary problems is discussed. A long term hope is that this work will complement and further refine existing numerical schemes for finding such solutions. Author

N85-26273# Sandia Labs., Albuquerque, N. Mex.

SPLOT: A PLOT PROGRAM FOR FINITE ELEMENT DATA, FUNCTION VERSUS DISTANCE

Mary Richgels Sagartz Jan. 1985 37 p refs
(Contract DE-AC04-76DP-00789)
(DE85-007129; SAND-84-1406) Avail: NTIS HC A03/MF A01

SPLOT is a plotting program that plots finite element results against distance along a user specified group of elements or nodes. The user specifies the two or three dimensional finite element results to plot against the distance. SPLOT also has the feature of showing the user the finite element mesh. This allows the user to choose his node or element numbers with confidence. The inputs to SPLOT are a set of commands and an analysis data tape. The data analysis tape is in a standardized plotting data

format. SPLOT is available as an interactive version for the VAX and a batch version for the CRAY. DOE

N85-26274# Ames Lab., Iowa.
CONNECTION BETWEEN TIME- AND FREQUENCY-DOMAIN THREE-DIMENSIONAL INVERSE PROBLEMS FOR THE SCHROEDINGER EQUATION
James H. Rose, Margaret Cheney (Duke Univ.), and Brian DeFacio (Missouri Univ., Columbia) 1985 7 p refs Presented at the Progr. in Quantitative NDR Meeting, San Diego, Calif., 8 Jul. 1984
(Contract W-7405-eng-82)
(DE85-005914; CONF-840738-14; IS-M-534) Avail: NTIS HC A02/MF A01

The use of inverse scattering methods in electromagnetic remote sensing, seismic exploration and ultrasonic imaging is rapidly expanding. For these cases which involve classical wave equations with variable velocity, no exact inversion methods exist for general three-dimensional (3d) scatterers. However, exact inversion methods (for example, those based on the Born series and the Newton-Marchenko equation) do exist for the 3d Schroedinger equation. These inversion methods for Schroedinger's equation will be rewritten in a form which brings out certain analogies with classical wave equations. It is hoped these analogies will eventually contribute to a common exact inversion method for both types of equations. DOE

N85-26275# Argonne National Lab., Ill. Mathematics and Computer Science Div.
IMPLEMENTATION OF WEEKS' METHOD FOR THE INVERSE LAPLACE TRANSFORM PROBLEM
G. Giunta, J. N. Lyness, and A. Murli (Universita di Napoli, Italy) Oct. 1984 30 p refs
(Contract W-31-109-eng-38)
(DE85-005919; ANL/MCS-TM-39) Avail: NTIS HC A03/MF A01

The authors are presently involved in constructing a software package for the numerical inversion of the Laplace transform is discussed. One item that obtains approximations for f(t) when numerical values of the Laplace transform function F(s) = Integral from 0 to infinity of f(t)e sup -st/ dt Re s > sigma0 and an accuracy parameter; sigma0 is known as the Laplace transform convergence abscissa. DOE

N85-26276# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
SOLUTION OF COUPLED SYSTEM OF PDE BY THE TRANSISTORIZED MULTIGRID METHOD
A. Shieh Jan. 1985 25 p refs Presented at the 2nd Conf. on Numerical Simulation of VISI Devices, Boston, 12 Nov. 1984
(DE85-006377; EGG-M-29484; CONF-8411146-1) Avail: NTIS HC A02/MF A01

A transistorized Gummel's algorithm is presented for the numerical solution of the coupled system of nonlinear partial differential equations describing the intrinsic behavior of semiconductor devices for two-dimensional steady state problems. It is a tau-extrapolated high-order multi-grid algorithm. Mathematical transistors that transfer resistance to damping of error from low to medium frequencies on the coarse grid to high frequencies on the coarse grid to high frequencies on the fine grid are used to connect different grid levels. By combining them with half-weighting filters, a very efficient high-order algorithm with a very simple program structure is obtained. The error on the finest grid level is often less than that obtained by a conventional high-order tau-extrapolated scheme where all the relevant equations are solved to machine accuracy. The algorithm, however, is primarily intended only for problems that do not have strong currents. DOE

N85-26277# California Univ., Livermore. Lawrence Livermore Lab.
SLIDING INTERFACES WITH CONTACT-IMPACT IN LARGE SCALE LAGRANGIAN COMPUTATIONS
J. O. Hallquist, G. L. Goudreau, and D. J. Benson Dec. 1984 66 p refs Presented at 3rd Intern. Conf. on Finite Elements in Nonlinear Mech. (FENOMECH 84), Stuttgart, 10-14 Sep. 1984
(Contract W-7405-eng-48)
(DE85-006451; UCRL-91129; CONF-8409201-1) Avail: NTIS HC A04/MF A01

The two and three dimensional contact algorithms used in the finite element programs developed at the Lawrence Livermore National Laboratory are described in this paper. We are interested in both static contact and dynamic impact problems and, consequently, have pursued the development of two different algorithms. The first, based on the hydrocode technology of the sixties, is implemented on our two and three dimensional explicit finite element codes. The second, a symmetric penalty treatment, is used in our implicit codes and is optional in the explicit codes. The penalty methods are used to obtain solutions to almost all of our structural problems but we find that the hydrocode approach is vastly superior if pressures greatly exceed the yield strength. Examples are provided to show practical applications of both approaches. Author

N85-25305# Joint Publications Research Service, Arlington, Va.
PERTURBATIONS OF KALMAN FILTERING PROCESS Abstract Only
A. A. Chernov and V. D. Yastrebov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 26 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 537-542 Original language document announced as A84-48006
(For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25313# Joint Publications Research Service, Arlington, Va.
APPLICATION OF QUATERNIONS TO PROBLEMS OF SOLID BODY DYNAMICS IN THE ATMOSPHERE Abstract Only
G. M. Lokhov and S. I. Podzorov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 33 Transl. into ENGLISH from Kosmicheskiya Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 626-629 Original language document announced as A84-48017
(For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N85-26278*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
STATISTICAL COMPARISON OF POOLED NITROGEN WASHOUT DATA OF VARIOUS ALTITUDE DECOMPRESSION RESPONSE GROUPS
Ben F. Edwards, James M. Waligora, and David J. Horrigan, Jr. Apr. 1985 15 p refs
(NASA-TM-58265; S-545; NAS 1.15:58265) Avail: NTIS HC A02/MF A01 CSCL 12A

This analysis was done to determine whether various decompression response groups could be characterized by the pooled nitrogen (N2) washout profiles of the group members, pooling individual washout profiles provided a smooth time dependent function of means representative of the decompression response group. No statistically significant differences were detected. The statistical comparisons of the profiles were performed by means of univariate weighted t-test at each 5 minute profile point, and with levels of significance of 5 and 10 percent. The estimated powers of the tests (i.e., probabilities) to detect the observed differences in the pooled profiles were of the order of 8 to 30 percent. B.W.

N85-26279*# Management and Technical Services Co., Houston, Tex.
STATISTICAL ANALYSIS TECHNIQUES FOR SMALL SAMPLE SIZES
Sharon E. Navard Sep. 1984 94 p refs
(Contract NAS9-17151)
(NASA-CR-171872; NAS 1.26:171872; TIR-2114-MED-4005) Avail:

NTIS HC A05/MF A01 CSCL 12A

The small sample sizes problem which is encountered when dealing with analysis of space-flight data is examined. Because of such an amount of data available, careful analyses are essential to extract the maximum amount of information with acceptable accuracy. Statistical analysis of small samples is described. The background material necessary for understanding statistical hypothesis testing is outlined and the various tests which can be done on small samples are explained. Emphasis is on the underlying assumptions of each test and on considerations needed to choose the most appropriate test for a given type of analysis. E.A.K.

N85-26280# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.

POINT PROCESSES ASSOCIATED WITH EXTREME VALUE THEORY Ph.D. Thesis

T. Hsing Dec. 1984 84 p

(Contract F49620-82-C-0009)

(AD-A151211; TR-83; AFOSR-85-0204TR) Avail: NTIS HC A05/MF A01 CSCL 12/1

This work demonstrates the application of point process theory in the context of statistical extremes. Consider a stationary random sequence which satisfies certain dependence restrictions. We study the asymptotic behavior of a sequence of point processes that record the positions at which extreme values occur. Necessary and sufficient conditions are given for the weak convergence of the sequence. It is found that the usual Poisson limit when the random sequence is i.i.d. is replaced by a Compound Poisson limit. The asymptotic distributions of extreme order statistics are derived from the weak convergence result using simple combinatorial arguments. A class of point processes in two dimensions is also considered. The weak limit is characterized to be a cluster process which is determined by a homogeneous Poisson Process and the local dependence structure of the random sequence. A random sequence whose members are the weighted maxima of i.i.d. random variables is studied. It is shown that the sequence satisfies our dependence restrictions, and the point process results developed can be applied. Specific limit forms of the various point processes of interest are derived. Author (GRA)

N85-26281# Johns Hopkins Univ., Baltimore, Md. Dept. of Mathematical Sciences.

INFERENCE AND STATE ESTIMATION FOR STOCHASTIC POINT PROCESSES Interim Scientific Report, 1 Jan. - 31 Dec. 1984

A. F. Karr 23 Jan. 1985 14 p

(Grant AF-AFOSR-0029-82)

(AD-A151216; AFOSR-85-0173TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Stochastic point processes are models of points distributed randomly in some space; these points may represent, for example, locations (or even trajectories) of tracked objects, times and amounts of precipitation events, or failure times and modes of a complex system. This research project is directed toward two principal problems arising in applications of point processes: statistical inference for point processes whose probability law is unknown entirely or in part, and state estimation for partially observed point processes, i.e., minimum mean squared error reconstruction, realization-by-realization, of random variables that are not directly observable. These problems are examined in several (not disjoint) contexts: stationary point processes, Cox processes, multiplicative intensity processes and Poisson processes. Another thrust of the research is inference for stochastic processes based on point process samples, with the particular goal to investigate inference and state estimation for random fields given point process samples. This report documents results in the research for this period. Author (GRA)

N85-26282# Florida State Univ., Tallahassee. Dept. of Statistics.

STATISTICAL ASPECTS OF RELIABILITY, MAINTAINABILITY AND AVAILABILITY Final Report, 30 Sep. 1983 - 29 Sep. 1984

M. Hollander and F. Proschan Dec. 1984 14 p

(Contract F49620-82-K-0007)

(AD-A151228; AFOSR-85-0003TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report documents the results of three years of operation of the Reliability Center at Florida State University. During this period 45 technical reports and 43 papers in journals were published on statistical aspects of reliability. In addition, 15 visiting researchers were supported at the Center. GRA

N85-26283# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision.

GENERATION AND TERMINATION OF BINARY DECISION TREES FOR NONPARAMETRIC MULTICLASS CLASSIFICATION

S. Gelfand and S. K. Mitter Oct. 1984 16 p

(Contract DAAG29-84-K-0005)

(AD-A151361; LIDS-P-1411; ARO-20980.12-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

A two-step procedure for nonparametric multiclass classifier design is described. A multiclass recursive partioning algorithm is given which generated a single binary decision tree for classifying all classes. The algorithm minimizes the Bayes risk at each node. A tree termination algorithm is given which optimally terminates binary decision trees. The algorithm yields the unique tree with fewest nodes which minimizes the Bayes risk. Tree generation and termination are based on the training and test samples, respectively. GRA

N85-26284# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.

BAYESIAN ESTIMATION OF ONE DIMENSIONAL DISCRETE MARKOV RANDOM FIELDS Technical Report

J. L. Marroquin Dec. 1984 36 p

(Contracts DAAG29-84-K-0005; N00014-80-C-0505)

(AD-A151503; LIDS-P-1423; ARO-20980.9-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document presents two deterministic algorithms for the maximum a posteriori estimation of a one dimensional, binary Markov random field from noisy observations. Extensions to other related problems, such as one dimensional signal matching, and estimation of continuous valued Markov random fields are also discussed. Finally, the author presents an experimental comparison of the performance of optimal algorithms with a stochastic approximation scheme (simulated annealing). Author (GRA)

N85-26285# Rice Univ., Houston, Tex. Dept. of Mathematical Sciences.

CONSTRUCTION OF EFFICIENT ALGORITHMS FOR THE ESTIMATION OF MULTIVARIATE PROBABILITY DENSITIES Final Report, 1 Nov. 1981 - 31 Oct. 1984

J. R. Thompson 4 Jan. 1985 7 p

(Contract DAAG29-82-K-0014)

(AD-A151509; ARO-18623.16-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

State of the art software has been created for the nonparametric estimation and contour display of densities of dimensions through five. A nonparametric mode finding algorithm has been developed for densities of dimension up to one hundred. An algorithm for data based simulation from high dimensional distributions has been created and employed on behind armour data. In the related area of parameter estimation of stochastic processes, simulation based algorithms have been developed which enable the user to proceed directly from the axioms of the process plus data to the estimation of parameters. Author (GRA)

N85-26286# State Univ. of New York, Binghamton. Center for Statistics Quality Control and Design.

POISSON AND MULTINOMIAL SHADOWING PROCESSES Final Report, 1 Oct. 1983 - 30 Sep. 1984

S. Zacks Dec. 1984 11 p

(Contract DAAG29-83-K-0176)

(AD-A151600; ARO-21096.3-MA) Avail: NTIS HC A02/MF A01

CSCL 12/1

Research concentrated on problems connected with shadowing processes in the plane. Three technical reports were issued. The titles are: (1) The Distribution of A Weighed Visibility Measure On A Line Segment Under Shadows Cast By Random Disks Having A Bivariate Normal Scattering; (2) The Visibility of Stationary and Moving Targets In The Plane Subject To A Poisson Field Of Shadowing Elements; (3) Approximating The Probabilities of Detecting And Of Hitting Targets And The Probability Distribution Of The Number of Trials Along the Visible Portions Of Curves In the Plane Subject To A Poisson Shadowing Process. GRA

N85-26287# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

A NON-PARAMETRIC PROBABILITY DENSITY ESTIMATOR AND SOME APPLICATIONS Ph.D. Thesis

R. P. Fuchs May 1984 150 p

(AD-A151853; AFIT/DS/ENC/84-1) Avail: NTIS HC A07/MF A01 CSCL 12/1

In this thesis a new non-parametric probability density estimator is developed which has the following properties: (1) It yields a continuous, non-negative and piecewise linear estimate of a probability density function. (2) It converges to the true density function if the true density has no more than a finite number of discontinuities of a form where the value of the function at the discontinuity can be considered the average of the limiting values on either side of the discontinuity. (3) It requires no user supplied parameters. The estimator is shown to have significantly better error properties, for certain classes of distributions, than existing density estimators. The quality of the estimate is discussed, tabulated and graphically demonstrated. Applications, including parameterization, small sample analysis, and two sample tests are presented. These newly developed applications are shown to improve upon the generally accepted existing techniques. Guidelines for choosing a density estimation method along with an organized approach to method selection are discussed. GRA

N85-26288# Pittsburgh Univ., Pa. Center for Multivariate Analysis.

ON LIMITING EMPIRICAL DISTRIBUTION FUNCTION OF THE EIGENVALUES OF A MULTIVARIATE F MATRIX, REVISED

Z. D. Bai, Y. Q. Yin, and P. R. Krishnaiah Dec. 1984 22 p

(Contracts F49620-82-K-0001; F49620-85-C-0008)

(AD-A151885; TR-84-42-Rev; AFOSR-85-0262TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper, the authors derived an explicit expression for the limit of the empirical distribution function (e.d.f.) of a central multivariate F matrix when the number of variables and degrees of freedom both tend to infinity in certain fashion. The authors also extended the above result to the case when the underlying distribution is not necessarily multivariate normal but the first four moments exist. The limiting distribution is useful in deriving the limiting distributions of certain test statistics which arise in multivariate analysis of variance, canonical correlation analysis and tests for the equality of two covariance matrices. GRA

N85-26289# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

ASYMPTOTIC EXPANSIONS OF THE DISTRIBUTION OF TEST STATISTICS ASSOCIATED WITH SEVERAL TWO PARAMETER EXPONENTIAL DISTRIBUTIONS M.S. Thesis

D. J. Lawton Dec. 1984 109 p

(AD-A151906; AFIT/GM/MATH/84D-1) Avail: NTIS HC A06/MF A01 CSCL 12/1

This thesis used three criteria to test for equality of p populations with underlying two parameter exponential distributions (theta = location parameter, sigma = scale parameter). The criers use n random samples drawn for each of the p populations. The three criteria are based on three hypotheses. The asymptotic expansion of the distributions are found based on the Neyman-Pearson likelihood ratio. The asymptotic expansions are computed using Bernoulli polynomials and a recursive relationship developed by Kalinin and Shalaevskii. Nine tables of percentage points are computed for each test statistic from the expansions where p = 2(1)10, n = 10(1)20(5)50(10)100, and alpha = .100, 050, .025, .010, .005. These tables along with a practical illustration give the analyst a good technique that can be applied to many exponentially related situations. GRA

N85-26290# California Univ., Livermore. Lawrence Livermore Lab.

SCATTERED DATA INTERPOLATION AND APPROXIMATION

Thomas A. Foley (Arizona State Univ.) 11 Feb. 1985 25 p refs (Contract W-7405-eng-48)

(DE85-007495; UCID-20346) Avail: NTIS HC A02/MF A01

Three-stage methods for interpolating and approximating three-dimensional scattered surface data are presented. Error bounds are derived for both the interpolation and approximation methods that are on the order of h/sup k/ where k = 3,4. These methods are shown to be accurate and visually smooth on known functional data, as well as being stable and computationally efficient on large data sets. DOE

N85-26291# California Univ., Berkeley. Lawrence Berkeley Lab.

LECTURES ON PROBABILITY AND STATISTICS

G. P. Yost Sep. 1984 150 p refs Presented at a Course on Statist., London, Jan. - Apr. 1984

(Contract DE-AC03-76SF-00098)

(DE85-007079; LBL-16993) Avail: NTIS HC A07/MF A01

These notes are based on a set of statistics lectures delivered at Imperial College to the first-year postgraduate students in High Energy Physics. They are designed for the professional experimental scientist. We begin with the fundamentals of probability theory, in which one makes statements about the set of possible outcomes of an experiment, based upon a complete a priori understanding of the experiment. For example, in a roll of a set of (fair) dice, one understands a priori that any given side of each die is equally likely to turn up. From that, we can calculate the probability of any specified outcome. We finish with the inverse problem, statistics. Here, one begins with a set of actual data (e.g., the outcomes of a number of rolls of the dice), and attempts to make inferences about the state of nature which gave those data (e.g., the likelihood of seeing any given side of any givendie turn up). This is a much more difficult problem, of course, and one's solutions often turn out to be unsatisfactory in one respect or another. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N85-26292# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

FEASIBILITY ANALYSIS OF MOVING BANK MULTIPLE MODEL ADAPTIVE ESTIMATION AND CONTROL ALGORITHMS M.S. Thesis

K. P. Hentz Dec. 1984 369 p

(AD-A152015; AFIT/GE/ENG/84D-32) Avail: NTIS HC A16/MF A01 CSCL 12/2

This investigation examines the feasibility of a moving bank multiple model adaptive estimation/control algorithm. Sliding bank multiple model adaptive estimation differs from conventional multiple adaptive estimation in that a substantially reduced number of elemental filters is required for the sliding bank estimator (9 elemental filters vs. 100 for the system modeled in this thesis). The positions in parameter space that the reduced number of elemental filters occupy are dynamically re-declared: i.e., the sliding bank of filters is moved about the parameter space in search of the true parameter point. Critical to the performance of the sliding bank estimator is the decision method that governs movement of the bank of elemental filters. Because of this, a number of different decision algorithms are discussed and their respective performance compared. Three controller designs are also examined: a single changeable-gain, a single fixed-gain, and a sliding bank multiple

model adaptive controller. States of a damped second order system, with uncertain parameters (damping ratio and undamped natural frequency) are estimated by the sliding bank estimator and then regulated to the quiescent state by the controller. Performance of the sliding bank estimator/controller is compared to a benchmark of a single Kalman filter/LQ controller that has (artificial) knowledge of the true parameter values. Comparisons are based upon Monte Carlo analysis results. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N85-26293# Hull Univ. (England). Dept. of Electronic Engineering.
FUNDAMENTAL EQUIVALENCE OF GENERALISED STATE SPACE SYSTEMS
G. E. Hayton, P. Fretwell, and A. C. Pugh (Loughborough Univ. of Technology) Oct. 1984 26 p refs
(Mathematics-Research-182) Avail: NTIS HC A03/MF A01

The paper defines a fundamental form of equivalence between two generalized state space systems in terms of mappings of the solution sets of the describing differential equations together with mappings of the sets of restricted initial conditions. Properties of this equivalence relation are discussed. It is shown to be an alternative characterization of the system matrix relationship of complete system equivalence. Author

N85-26294# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
ON ASYMPTOTIC JOINT DISTRIBUTION OF THE EIGENVALUES OF THE NONCENTRAL MANOVA MATRIX FOR NONNORMAL POPULATIONS
Z. D. Bai, P. R. Krishnaiah, and W. Q. Liang Dec. 1984 18 p
(Contract F49620-85-C-0008)
(AD-A151886; TR-84-53; AFOSR-85-0263TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The problem of testing the hypothesis of the inequality of the mean vectors of several multivariate populations with a common covariance matrix received considerable attention in the literature. The test procedures are based upon certain functions of the eigenvalues of the multivariate analysis of variance (MANOVA) matrix. In the univariate case, the MANOVA matrix reduces to the ratio of the between group and within group sums of squares. The joint distribution of the eigenvalues of the MANOVA matrix in the noncentral case is useful in studying the power of the tests for the inequality of the mean vectors. This distribution is also useful in the problems connected with selection of important discriminant functions in the area of classification. Fisher, Hsu, and Roy have independently derived the joint distribution of the eigenvalues of the MANOVA matrix in the central case. Hsu derived the above distribution in the noncentral case when the sample size tends to infinity and the underlying distribution is multivariate normal. In proving the above result, Hsu assumed that the ratios of the sample sizes of the groups to the total sample size tend to constants in the limiting case. This paper extends the result of Hsu to the case when the underlying distribution is not necessarily multivariate normal. GRA

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N85-26295 Atomic Energy Research Establishment, Harwell (England). Theoretical Physics Div.
A LITERATURE REVIEW OF EMATS, WITH STRESS CALCULATIONS FOR SIMPLE EMAT GEOMETRIES
J. A. Ogilvy Mar. 1985 34 p refs
(AERE-R-11415; ISBN-0-7058-1410-6) Copyright. Avail: HMSO, London, Engl. £ 5.00

Literature on Electro-Magnetic Acoustic Transducers (EMATs) is reviewed. The primary aim is to identify the commonly used EMAT designs and hence to establish useful areas of theoretical input to the EMAT development program. The major designs used in industry and the applications to which these are put are examined. Advantages of EMATs, as ultrasonic wave sources, over conventional piezoelectric transducers are discussed. Some calculations are performed for the surface stresses obtained from some simple EMAT configurations. Applications of these EMAT designs are discussed in the light of the results so obtained. Author

N85-26296# Ford Aerospace and Communications Corp., Palo Alto, Calif.
BROWNIAN MOTION WITH QUADRATIC KILLING AND SOME IMPLICATIONS: REVISION
M. L. Wenocur Jan. 1985 14 p
(Contracts DAAG29-82-K-0151; N00014-82-C-0620)
(AD-A151323) Avail: NTIS HC A02/MF A01 CSCL 07/4

Brownian motion subject to a quadratic killing rate and its connection with the Weibull distribution is analyzed. The distribution obtained for the process killing time significantly generalizes the Weibull. The derivation involves the use of the Karhunen-Loeve expansion for Brownian motion, special function theory, and the calculus of residues. Author (GRA)

N85-26297# California Univ., Berkeley. Lawrence Berkeley Lab.
APPLICATION OF PERMANENT MAGNETS IN ACCELERATORS AND ELECTRON STORAGE RINGS
Klaus Halbach Sep. 1984 24 p refs Presented at the 30th Ann. Conf. on Magnetism and Magnetic Mater., San Diego, Calif., 17 Nov. 1984
(Contract DE-AC03-76SF-00098)
(DE85-004981; LBL-18298) Avail: NTIS HC A02/MF A01

After an explanation of the general circumstances in which the use of permanent magnets in accelerators is desirable, a number of specific magnets will be discussed. That discussion includes magnets needed for the operation of accelerators as well as magnets that are employed for the utilization of charged particle beams, such as the production of synchrotron radiation. DOE

N85-26298# California Univ., Berkeley. Lawrence Berkeley Lab. Physics, Computer Science and Mathematics Div.
PHYSICS, COMPUTER SCIENCE AND MATHEMATICS DIV. Annual Report, 1 Jan. - 31 Dec. 1983
J. David Jackson Aug. 1984 103 p refs
(Contract DE-AC03-76SF-00098)
(DE85-006868; LBL-18260) Avail: NTIS HC A06/MF A01

Experiments on electron-positron collisions using PEP, the high energy storage ring are summarized as well as other studies of high energy interactions. The development of a 10-meter telescope and results are supernovae research are considered. Highlights are given of basic and applied research in mathematics, computer science, and statistics. A.R.H.

N85-26299# California Univ., Livermore. Lawrence Livermore Lab.
HIGH SPEED ELECTRIC FIELD AND VOLTAGE MEASUREMENTS WITH FIELD COUPLED SENSORS
M. S. DiCapua 12 Dec. 1984 7 p refs Presented at the IMTC '85 Instr. and Meas. Technol. Conf., Tampa, Fla., 20 Mar. 1985
(Contract W-7405-eng-48)
(DE85-006637; UCRL-91839; CONF-850340-2) Avail: NTIS HC A02/MF A01

The concept of displacement vector (D) measurements with floating electrodes, measurements with resistively grounded electrodes are discussed and the relationship is introduced. Measurements of voltage and electric field are explored. Errors is measurements with floating electrodes are discussed. E.A.K.

N85-26300# Joint Publications Research Service, Arlington, Va.
USSR REPORT: PHYSICS AND MATHEMATICS

11 Apr. 1985 88 p Transl. into ENGLISH from various Russian articles
(JPRS-UPM-85-003) Avail: NTIS HC A05/MF A01

News items, abstracts, and scientific reports on aspects of physics and mathematics including thermodynamics; stress, strain, and deformation; plasma physics; nuclear physics; optics and spectroscopy; crystals and semiconductors; molecular physics; lasers and masers; and fluid dynamics. For individual titles, see N85-26301 through N85-26315.

N85-26301# Joint Publications Research Service, Arlington, Va.
RAMAN SCATTERING OF LIGHT IN EPITAXIAL FILMS OF SOLID PHOSPHIDE-GALLIUM ARSENIDE SOLUTIONS Abstract Only **c76**
V. S. Gorelik, R. N. Khashimov, and A. P. Vidanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 1-2 Transl. into ENGLISH from Fiz. i Tekhn. Poluprovodnikov (Leningrad), v. 18, no. 8, Aug. 1984 p 1403-1407 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

A method is proposed for using Raman light scattering spectra to investigate epitaxial films of GaP(1-x)As(x) grown on gallium phosphide substrates. An oblique cut of GaP(1-x)As(x) film was investigated in order to study the characteristics of the transitional layer. The Raman scattering data are compared with the results of investigating the same specimen using the X-ray microanalysis method. The optical phonon frequencies corresponding to vibrations of the crystal sublattice of phosphorus are shown to decrease linearly as the concentration of x increases from 0 to 0.16. It is shown that the Raman scattering method can be used to monitor the concentration of solid solution components and to study their vertical distribution through the film. Author

N85-26302# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF RECRYSTALLIZATION AND REDISTRIBUTION OF IMPURITIES IN SEMICONDUCTORS SUBJECTED TO MILLISECOND LASER PULSES Abstract Only **c76**
S. G. Kiyak, A. K. Shukhostanov, G. V. Savitskiy, S. Zh. Gonov, and V. V. Gafiychuk *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 2 Transl. into ENGLISH from Fiz. i Tekhn. Poluprovodnikov (Leningrad), v. 18, no. 8, Aug. 1984 p 1446-1449 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

The kinetics of millisecond laser pulses acting upon semiconductors are investigated by reflecting probing radiation from the irradiated surface of the crystal. The characteristics of fusion, recrystallization and impurity redistribution associated with the spike nature of laser radiation in the free lasing mode are investigated. The temporal characteristics of fusion and recrystallization were investigated on germanium specimens by charting the variation in intensity of probing radiation from an LG52-1 helium-neon laser reflected from the surface. The surface layer of the crystals was heated and fused by radiation from a GOS-301 neodymium-laser. It is found that millisecond laser pulses (under optimum conditions) can produce uniformly recrystallized layers with modified physical and mechanical characteristics. The influence of segregation effects and impurity evaporation processes on the properties of the recrystallized layers is discussed. The radiation mode employed can be used to remove adsorbed layers from the crystal surfaces, and to eliminate reaction products formed during chemical treatment of the material. Author

N85-26303# Joint Publications Research Service, Arlington, Va.
NUMERICAL ANALYSIS OF SUPERSONIC REACTIVE FLOW IN WAKE OF REVERSE STEP Abstract Only **c02**
N. N. Yanenko and V. I. Golovichev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 4 Transl. into ENGLISH from Fiz. Goreniya i Vzryva (Novosibirsk, USSR), v. 20, no. 4, Jul. - Aug. 1984 p 52-56 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

The effectiveness of radial injection of fuel into a chamber is investigated for the case in which the jet injected parallel to the axis (or plane) of symmetry of the flow is not completely expanded. The flow is described by solving the complete time-dependent viscous gas dynamic equations (Navier-Stokes equations) in conjunction with the mass transfer equations of the individual components of the mixture, in which the source terms describe all of the nonequilibrium physical-chemical processes occurring in the flow. A five-component gas mixture is analyzed in which two chemical reactions occur and in which the power profile and kinetic parameters approximately describe the mechanism of hydrogen combustion in air. The most complete combustion is obtained by feeding in additional fuel by injecting a sonic jet of hydrogen through an additional injector in the center of the channel. Author

N85-26304# Joint Publications Research Service, Arlington, Va.
NUMERICAL MODELING OF GAS DYNAMIC PHENOMENA DURING SUPERSONIC FLOW OF VISCOUS GAS IN CHANNEL WITH ELECTRICAL FLOW DISCHARGE Abstract Only **c02**
P. A. Voynovich, B. M. Dymshits, and A. A. Fursenko *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 5-6 Transl. into ENGLISH from Pisma v Zh. Tekhn. Fiz. (Leningrad), v. 10, no. 15, 12 Aug. 1984 p 908-911 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

The gas dynamic characteristics of a supersonic gas flow in the zone of a glow discharge is investigated. A laminar gas flow near the surface of the electrode in a channel is studied as an example. The growth of heat boundary layers and heating of gas in those layers reduce the useful volume of the discharge zone. It is found effective to evacuate the boundary layers through the wall in order to prevent their growth and to circumvent heating of the gas near the electrodes. Distributed evacuation through the channel wall also helps to prevent turbulization in the channel. Author

N85-26305# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF LASER EMISSION DISCHARGE CREATED BY PULSED CO2-LASER Abstract Only **c36**
E. M. Barkhudarov, G. V. Gelashvili, G. G. Gumberidze, D. I. Razmadze, and M. I. Taktakishvili *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 9 Transl. into ENGLISH from Fiz. Plazmy (Moscow), v. 10, no. 4, Jul. - Aug. 1984 p 757-761 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

The parameters of a laser-emission discharge plasma (lambda = 10.6 micron, I = 10 to the 10th power W/sq cm) and its characteristics as an emf source are investigated. The parameters of the plasma flame created by a pulsed CO2 laser are determined; the expansion rate, concentration and electron temperature during the initial and final stages of expansion are found. The basic characteristics of a laser-emission discharge as a emf source are measured: the amount of emf, the internal resistance and the efficiency, inter alia. It is shown possible to determine the electron temperature during the initial stage of expansion of a plasma flame from the voltage-current characteristic of the discharge. Author

N85-26306# Joint Publications Research Service, Arlington, Va.
THEORETICAL INVESTIGATION OF LASING IN 4.3 MICRON REGION IN CO2 LASER Abstract Only **c36**
M. M. Ivanenko, S. A. Trushin, and V. V. Churakov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 10-11 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 46, no. 3, Sep. 1984 p 408-415 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

The limiting energy characteristics of a 4.3 micrometers pulsed CO2 laser was investigated, and the conditions necessary for realizing them are determined. The influence of the various physical processes occurring in the active medium on the output parameters of the laser system is analyzed. The lasing process in a CO2:n:2:He mixture pre-excited in an electrical discharge is modeled numerically. It is found that maximum lasing power in energy is achieved when the pumping and lasing radiation is coupled through a

common rotational sublevel. Radiation energy as high as 200 mj/l can be obtained under actual experimental conditions. Author

N85-26307# Joint Publications Research Service, Arlington, Va.
SUBMILLIMETER-BAND SOLID STATE DISTRIBUTED FEEDBACK LASER Abstract Only **c36**
A. G. Aleksanyan, G. P. Boyakhchyan, and E. G. Mirzavekyan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 12-13 Transl. into ENGLISH from Izv. Akad. Nauk Armyanskoy SSR: Fiz. (Yerevan, USSR), v. 19, no. 4, Jul. - Aug. 1984 p 198-205 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

The threshold characteristics of a solid state laser with anisotropic gain is analyzed. Allowance for anisotropy of the gain results in an asymmetric mode spectrum and a complex coupling coefficient that depends upon the thickness of the specimen, the permittivity of the active and passive media and the frequency of the acoustic wave. Resonant Bragg diffraction scattering is examined, assuming that the active medium, which is created by a magnetic field and an ultrasonic wave, is contained in a homogeneous dielectric medium with permittivity Epsilon sub 1. An acoustic wave with wave number Beta sub zero = 2 Pi/Lambda propagating along the x axis caused the permittivity to change, thus facilitating distributed feedback. It is found, in contrast to the simple isotropic case, that the coefficient of absorption and the coupling coefficient change significantly: an effective index of refraction of the wave and an effective complex coupling coefficient occur which depend upon the thickness of the active region and the permittivities of the active and passive media. The threshold electron concentration is analyzed as a function of the feedback coefficient, of temperature for the first four modes and of the specimen length. Author

N85-26308# Joint Publications Research Service, Arlington, Va.
WAVEGUIDE PHENOMENA IN DENSE RELAXING GASES AND THEIR USE IN CHEMICAL AND GAS-DYNAMIC LASERS Abstract Only **c36**
B. D. Barmashenko, V. A. Kochelap, and V. V. Naumov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 13-14 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 9, Sep. 1984 p 1763-1771 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

The possibility of forming radiation by exploiting the gas-dynamic characteristics of flows within laser cavities is investigated. The periodic compression which occurs in flows can serve as gaseous dielectric waveguides which single out electromagnetic oscillations localized in narrow zones of inverse population. A shock wave in a chemically reacting H2-F2 mixture and the flow of a dissociated diatomic gas about a body with a cooled surface are considered as examples. Localization and amplification of light in the boundary layer during radiation recombination reactions of atoms are analyzed. The examples indicate that the electromagnetic field distribution in laser cavities can be modified by exploiting various gasdynamic characteristics of flows to achieve, inter alia, localization of the radiation in spatially narrow active layers. Author

N85-26309# Joint Publications Research Service, Arlington, Va.
AMPLIFICATION OF SCATTERED INDUCED RADIATION FLUX IN HIGH-GAIN LASER RODS Abstract Only **c36**
B. S. Skorobogatov and A. I. Usoskin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 16-17 Transl. into ENGLISH from Optika i Spektroskopiya (Leningrad), v. 56, no. 6, Jun. 1984 p 1099-1103 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

The spatial distribution of induced radiation flkux within a laser rod is determined through integrated investigations of the angular characteristics of the noisy induced radiation exiting the rod and the angular characteristics of the radiation scattering on its lateral surface. The measurements are made on neodymium activated yttrium aluminum garnet active elements in the form of a rod with a cylindrical surface and plane parallel polished ends. Antireflection coatings were applied to the ends of the elements to reduce reflection to approximately 0.1%. It is demonstrated that closed induced radiant fluxes for which lasing conditions are satisfied can form during strong scattering on the boundaries of the active medium. The stability of these fluxes depends strongly upon their orientation. The most stable fluxes are found to be those which scattered repeatedly at other than mirror angles. The occurrence of a halo of the induced radiation accompanying the occurrence of the generated mode is noted. Author

N85-26310# Joint Publications Research Service, Arlington, Va.
INDUSTRIAL LASER USE EXPANDING IN THE USSR **c36**
Ye. P. Velikhov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 18-23 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 14, Apr. 1983 p 2 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

The effect of lasers on industrial procedures and the economy is discussed. Some applications of lasers in industry which are considered are laser thermal technology, laser control of industrial processes and large scale chemical production. Lasers are applied in such fields as biology, environmental protection, construction and irrigation works, communications, computer technology, printing and image recording and processing. Lasers also have applications toward the problem of controlling thermonuclear reactions. Objectives of laser application studies are outlined. E.R.

N85-26311# Joint Publications Research Service, Arlington, Va.
BREAKTHROUGH IN CONTAINER CONFINEMENT OF ULTRA-COLD NEUTRONS **c72**
V. Okolotin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 38-39 Transl. into ENGLISH from Moskovskiy Komsomlets (Moscow), 3 Oct. 1984 p 4 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

The retention of ultracold neutrons is discussed. A method by which the lifetime of neutrons can be extended in reviewed. The creation of a pure contained in which the ultracold neutrons last for their whole lifetime makes this possible. The application of ultracold neutrons in optics is also discussed. Neutron optics aids in obtaining maximum contrast images of biological objects thereby determining the location and nature of individual atoms and groups of atoms. Other applications of this basic method of extending the life of neutrons are predicted. E.R.

N85-26312# Joint Publications Research Service, Arlington, Va.
SOLAR WIND AND COSMIC RAIN **c90**
B. Konovalov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 40-43 Transl. into ENGLISH from Izv. (Moscow), 3 Sep. 1984 p 3 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

An installation built to accumulate data so that conditions on the Sun and in space which are reflected in the state of the Earth and its surroundings can be studied is described. It studies extensive atmospheric showers which are encountered when the Earth comes into the path of cosmic particles with very high energy levels. This complex is used to study the state of the ionosphere, magnetic fields and telluric currents, cosmic rays and radio frequency radiation, the polar auroras and meteorological phenomena. E.R.

N85-26313# Joint Publications Research Service, Arlington, Va.
RADAR MEASUREMENT OF THICKNESS OF DRIFTING OCEAN ICE EMPLOYING CEPSTRAL SIGNAL PROCESSING Abstract Only **c33**
V. V. Bogorodskiy, V. I. Boyarskiy, and A. G. Oganesyan *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 56 Transl. into ENGLISH from Zh. Tekhn. Fiz. (Leningrad), v. 54, no. 7, Jul. 1984 p 1404-1406 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

The use of cepstral processing for radar signals reflected by year old drifting ice in contact radar probing is investigated. Radar measurements were taken over a path 10,000 km long using equipment carried aboard an IL-14 airplane. Collection flights were made at an altitude of 150 meters. More than 8,000 reflected signals were processed by computer, using cepstral probability and correlation algorithms. The standard deviation of the thickness measurement error was found not to exceed 10% for a thickness range of 0.3 to 1.7 m. Cepstral processing methods for reflected radar signals make it possible to obtain a statistically valid distribution of the ice thickness along the flight path. Author

N85-26314# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF THEORY OF HIGH-CURRENT HIGH-PRESSURE PULSED ARC Abstract Only c75
V. V. Korneyev, A. N. Lobanov, and K. N. Ulyanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 57 Transl. into ENGLISH from Elektrichestvo (Moscow), no. 9, Sep. 1984 p 25-29 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

Braginskiy's homogeneous model of the development of high pressure impulse arcs is extended to allow for change in the arc temperature and its electrical conductivity over time; the connection between pressure and the velocity of the shock wave front is discarded, and allowance is made for the intrinsic magnetic field of the arc. A system of ordinary differential equations is derived to describe the parameters of a high pressure impulse arc which allows for the real properties of the gas; it is found that the radius of the arc depends mainly upon the external parameter (ratio of initial current to its period of oscillation) with the temperature and resistance also depending strongly upon the initial radius and pressure. The intrinsic magnetic field retards the expansion of the channel and increases its temperature and resistance. Because of the high resistance of the arc, the system of equations must be solved jointly with the equation for the external circuit when the initial radii are small. Author

N85-26315# Joint Publications Research Service, Arlington, Va.
LOW-TEMPERATURE THERMAL EXPANSION OF GLASS Abstract Only c77
Yu. M. Galperin, V. L. Gurevich, and D. A. Parshin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 69-70 Transl. into ENGLISH from Pisma v Zh. Eksperim. i Teoreticheskoy Fiz. (Moscow), v. 40, no. 7, 10 Oct. 1984 p 283-286 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

A study of thermal expansion of glass is proposed to account for experimental findings according to which the coefficient of thermal expansion of glass at low temperatures is proportional to temperature, so that Gruneisen's ratio alpha sub T capital gamma C/K holds, where C is the specific heat capacity and K to the -1 power is the bulk modulus. It is found that the coefficient of thermal expansion of glass at low temperatures is a linear function of temperature and is caused by the occurrence of two level systems (similar to AHVP model of low temperature glasses). Gruneisen's constant is found to be anomalously large (of the order of 100), because of the softness of the local atomic potentials on which the two level systems are realized. The main contribution to the coefficient of thermal expansion is unsteady, i.e., it depends upon the duration of the experiment. The contribution of two level systems to alpha sub T in the case of metallic glass is combined with the contribution from conduction electrons, which is positive in the free electron model. Author

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N85-26316 Pennsylvania State Univ., University Park.
AN EXPERIMENTAL STUDY OF THE NOISE GENERATED BY VAPOROUS CAVITATION IN TURBULENT SHEAR FLOWS PRODUCED BY CONFINED ORIFICE PLATES Ph.D. Thesis
Sylvio Reynaldo Bistafa 1984 284 p
Avail: Univ. Microfilms Order No. DA8429059

An experimental investigation of the noise generated by vaporous cavitation in turbulent shear flows produced by confined sharp-edged orifice plates is reported. The investigation was conducted in two recirculating water tunnels, one with 6-inch and the other with 12-inch inside diameter test sections. The acoustic source strength of cavitation was determined based on reciprocity type measurements. SA review of the theory related to the incipient mechanism in turbulent sheer flows is presented, as well as an overview on bubble dynamics and the spectral characteristics of a single bubble cavitation noise. The statistical theories of cavitation noise are also presented. Author

N85-26317*# Boston Univ., Mass. Dept. of Communication Disorders.
CONTRIBUTION OF TONAL COMPONENTS TO THE OVERALL LOUDNESS, ANNOYANCE AND NOISINESS OF NOISE: RELATION BETWEEN SINGLE TONES AND NOISE SPECTRAL SHAPE Final Report
Rhona P. Hellman Washington NASA May 1985 148 p refs (Grant NsG-1644)
(NASA-CR-3892; NAS 1.26:3892) Avail: NTIS HC A07/MF A01 CSCL 20A

A large scale laboratory investigation of loudness, annoyance, and noisiness produced by single-tone-noise complexes was undertaken to establish a broader data base for quanitification and prediction of perceived annoyance of sounds containing tonal components. Loudness, annoyance, and noisiness were distinguished as separate, distinct, attributes of sound. Three different spectral patterns of broadband noise with and without added tones were studied: broadband-flat, low-pass, and high-pass. Judgments were obtained by absolute magnitude estimation supplement by loudness matching. The data were examined and evaluated to determine the potential effects of (1) the overall sound pressure level (SPL) of the noise-tone complex, (2) tone SPL, (3) noise SPL, (4) tone-to-noise ratio, (5) the frequency of the added tone, (6) noise spectral shape, and (7) subjective attribute judged on absolute magnitude of annoyance. Results showed that, in contrast to noisiness, loudness and annoyance growth behavior depends on the relationship between the frequency of the added tone and the spectral shape of the noise. The close correspondence between the frequency of the added tone and the spectral shape of the noise. The close correspondence between loundness and annoyance suggests that, to better understand perceived annoyance of sound mixtures, it is necessary to relate the results to basic auditory mechanisms governing loudness and masking. Author

N85-26318*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LONG RANGE DOWNWIND PROPAGATION OF LOW-FREQUENCY SOUND
William L. Willshire, Jr. Apr. 1985 21 p refs
(NASA-TM-86409; NAS 1.15:86409) Avail: NTIS HC A02/MF A01 CSCL 20A

The propagation of low-frequency noise outdoors was studied using as the source a large (80-m diameter) 4-megawatt horizontal axis wind turbine. Acoustic measurements were made with low-frequency microphone systems placed on the ground at five downwind sites ranging from 300 m to 10,000 m (6.3 mile) away from the wind turbine. The wind turbine fundamental was 1 Hz and the wind speed was generally 12 - 15 m/s at the hub height (80 m). The harmonic levels, when plotted versus propagation distance, exhibit a 3 dB per doubling of distance divergence. Two plausible explanations identified for this cylindrical spreading behavior were propagation of the low frequency wind turbine noise via a surface wave and downwind refraction. Surface was amplitude predictions were found to be more than 20 dB smaller than the measured levels. Ray-tracing results were used to qualitatively explain measured trends. A normal mode approach was identified

as a candidate method for low-frequency acoustic refraction prediction. Author

N85-26319*# Comtek, Grafton, Va.
AN EVALUATION OF PROPOSED ACOUSTIC TREATMENTS FOR THE NASA LaRC 4 X 7 METER WIND TUNNEL Final Report
A. Louis Abrahamson Apr. 1985 37 p refs Original contains color illustrations
(NASA-CR-172577; NAS 1.26:172577; COMTEK-8401) Avail: NTIS HC A03/MF A01 CSCL 20A

The NASA LaRC 4 x 7 Meter Wind Tunnel is an existing facility specially designed for powered low speed (V/STOL) testing of large scale fixed wing and rotorcraft models. The enhancement of the facility for scale model acoustic testing is examined. The results are critically reviewed and comparisons are drawn with a similar wind tunnel (the DNW Facility in the Netherlands). Discrepancies observed in the comparison stimulated a theoretical investigation using the acoustic finite element ADAM System, of the ways in which noise propagating around the tunnel circuit radiates into the open test section. The reasons for the discrepancies noted above are clarified and assists in the selection of acoustic treatment options for the facility. B.G.

N85-26320*# Missouri Univ., Rolla. Dept. of Mechanical and Aerospace Engineering.
FUNDAMENTAL STUDIES OF STRUCTURE BORNE NOISE FOR ADVANCED TURBOPROP APPLICATIONS Semiannual Report
W. Eversman and L. R. Koval May 1985 14 p refs
(Grant NAG1-394)
(NASA-CR-175737; NAS 1.26:175737) Avail: NTIS HC A02/MF A01 CSCL 20A

The transmission of sound generated by wing-mounted, advanced turboprop engines into the cabin interior via structural paths is considered. The structural model employed is a beam representation of the wing box carried into the fuselage via a representative frame type of carry through structure. The structure for the cabin cavity is a stiffened shell of rectangular or cylindrical geometry. The structure is modelled using a finite element formulation and the acoustic cavity is modelled using an analytical representation appropriate for the geometry. The structural and acoustic models are coupled by the use of hard wall cavity modes for the interior and vacuum structural modes for the shell. The coupling is accomplished using a combination of analytical and finite element models. The advantage is the substantial reduction in dimensionality achieved by modelling the interior analytically. The mathematical model for the interior noise problem is demonstrated with a simple plate/cavity system which has all of the features of the fuselage interior noise problem. A.R.H.

N85-26321# Naval Ocean Systems Center, San Diego, Calif.
SOUND PROPAGATION THROUGH DIRECTIONAL INTERNAL WAVE FIELDS Research Report, 1 Jun. 1982 - 1 Jun. 1983
J. A. Neubert Nov. 1984 25 p
(AD-A151168; NOSC/TR-1002) Avail: NTIS HC A02/MF A01 CSCL 20/1

Acoustic propagation can be used to discern directional internal waves in ambient ocean internal wave fields. The Rytov method gives the mean square sound-level fluctuations and the mean square phase fluctuations as a function for the fluctuating component of the refractive index. These relations are valid throughout the unsaturated regime of sound fluctuations. The propagating vertical displacement of the directional internal wave field is formed, and from its correlation lengths the necessary correlation lengths the necessary correlation function can be obtained. Thence, for the directional internal wave field are found. Next and for expected horizontally isotropic ambient internal wave field are determined by manipulation of the Garrett and Munk spectrum. This technique can be applied to the detection of a directional internal wave in a background field of horizontally isotropic ambient internal waves as shown in the example. Keywords include: underwater acoustics, Acoustic propagation, Rytov method. GRA

N85-26322# Department of the Army, Washington, D. C.
COMPENSATION OF ACOUSTIC WAVE DEVICES Patent Application
A. Ballato, inventor (to Army) Filed 1 Mar. 1985 16 p
(AD-D011582; US-Patent-Appl-SN-707346) Avail: NTIS HC A02/MF A01 CSCL 20/1

Compensation for the effects of environmentally caused changes and aging on piezoelectric acoustic wave devices is electrically provided by the application of a signal, such as a dc bias voltage, to the finger elements of an interdigital transducer formed on the surface of the acoustic wave device. This produces very large field concentrations at the finger edges which act to magnify the electric field and accordingly the electroacoustic effect which alters the acoustic waves and reflected bulk acoustic waves propagating in a piezoelectric substrate between input and output interdigital transducers. GRA

N85-26323# Spectron Development Labs., Inc., Costa Mesa, Calif.
AN ELECTRO-OPTIC SPATIAL LIGHT MODULATOR FOR THERMOELASTIC GENERATION OF PROGRAMMABLY FOCUSED ULTRASOUND Final Report
Dec. 1984 41 p
(Contract N00014-84-C-0058)
(AD-A152066; SDL-85-2361-02) Avail: NTIS HC A03/MF A01 CSCL 20/1

The concept proposed is an electro-optic technique that would make it possible to spatially modulate a high power pulsed laser beam to thermoelastically induce focused ultrasound in a test material. Being a purely electro-optic device, the modulator, and therefore the depth at which the acoustic focus occurs, can be programmed electronically at electronic speeds. If successful, it would become possible to scan ultrasound continuously in three dimensions within the component or structure under test.
Author (GRA)

N85-26324# Sandia Labs., Albuquerque, N. Mex.
VAPOR SENSING BY MEANS OF A ZnO-ON-Si SURFACE ACOUSTIC WAVE RESONATOR
S. J. Martin, K. S. Schweizer, S. S. Schwartz (Purdue Univ., Lafayette, Ind.), and R. L. Gunshor (Purdue Univ., Lafayette, Ind.) 1984 21 p refs Presented at the IEEE Ultrasonics Symp., Dallas, 14 Nov. 1984
(Contract DE-AC04-76DP-00789)
(DE85-003250; SAND-84-1373C; CONF-8411119-3) Avail: NTIS HC A02/MF A01

Surface Acoustic Wave (SAW) devices can function as sensitive detectors of vapors. The high surface acoustic energy density of the device makes it extremely sensitive to the presence of molecules adsorbed from the gas phase. Mass loading by the adsorbate is the primary mechanism for the surface wave velocity perturbation. If the device is used as the frequency control element of an oscillator, perturbations in wave velocity on the order of 10 parts per billion may be resolved by means of a frequency counter. Zno-on-Si SAW resonators have been examined as vapor sensors. The piezoelectric ZnO layer permits transduction between electrical and acoustic energies, as well as endowing the surface with particular adsorptive properties. These devices exhibit C-values up to 12,000 at a resonant frequency of 109 MHZ. The resonant frequency of the device shifts upon exposure to a vapor-air mixture, with a transient response which is distinct for each of the organic vapors tested. Due to the permeability of the polycrystalline ZnO layer, the instantaneous reversibility of the resonant frequency shift is found to depend on the type of adsorbed molecule. DOE

N85-26325# Ames Lab., Iowa.
ULTRASONIC CHARACTERIZATION OF POROSITY: THEORY
James H. Rose 1984 11 p refs Presented at the Progress in Quantitative NDE, San Diego, Calif., 8 Jul. 1984
(Contract W-7405-eng-82)
(DE85-005922; IS-M-532; CONF-840738-13) Avail: NTIS HC A02/MF A01

The volume fraction of pores in cast materials is often used as a quality control and product acceptance criterion. The use of

backscattered ultrasound to characterize the volume fraction of pores in A357 cast aluminum is analyzed. Important constraints on possible measurement methods are: (1) single sided access; (2) rapid scan rates; and (3) high sensitivity (i.e., the ability to measure volume fractions on the order of .1%). First, general aspects of ultrasonic scattering from porous media are discussed. These general results focus attention on the frequency dependent attentuation which is reviewed next. Then, following a proposal of Gubernatis and Domany, a method of determining the volume fraction and pore size is given. This method is then characterized by a figure-of-merit. DOE

N85-25566# Joint Publications Research Service, Arlington, Va.
FIELD OF POINT SOURCE OF LOW-FREQUENCY SOUND IN ATMOSPHERE WITH ALTITUDINALLY NONUNIFORM WIND Abstract Only
I. P. Chunchuzov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 1 refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 4, Jul. - Aug. 1984 p 546-552 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25567# Joint Publications Research Service, Arlington, Va.
WAVE DESCRIPTION OF SOUND PROPAGATION THROUGH STRATIFIED MOVING ATMOSPHERE Abstract Only
V. Ye. Ostashev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 2 refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 4, Jul. - Aug. 1984 p 521-526 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25568# Joint Publications Research Service, Arlington, Va.
SURFACE ACOUSTIC WAVE STRUCTURE AND VOLUME WAVES Abstract Only
V. I. Anisimkin, I. N. Kotelyanskiy, and M. A. Magomedov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 2-3 refs Transl. into ENGLISH from Akust. Zh., v. 30, no. 4, Jul. - Aug. 1984 p 417-423 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25570# Joint Publications Research Service, Arlington, Va.
SOUND EMISSION BY PARTICLE BEAM PASSING THROUGH HOLE IN RIGID SHIELD Abstract Only
v. I. Pavlov and A. I. Sukhorukov *In its* USSR Rept;.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 4 refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 4, Jul. - Aug. 1984 p 527-531 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25571# Joint Publications Research Service, Arlington, Va.
RECORDING OF ACOUSTIC WAVE IN GASEOUS MEDIUM WITH THIN-FILM PYROELECTRIC TRANSDUCERS Abstract Only
S. V. Belyayev, V. M. Gorelik, K. A. Konkov, Ye. A. Myzgin, G. M. Pleshkov, E. D. Polskikh, and B. A. Chayanov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 5 refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 4, Jul. - Aug. 1984 p 428-431 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25572# Joint Publications Research Service, Arlington, Va.
SPACE PROCESSING OF ACOUSTIC SIGNALS IN PLANE-PARALLEL WAVEGUIDE Abstract Only
A. Ya. Kalyuzhnyy, L. G. Krasnyy, and V. V. Krizhanovskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 6 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 4, Jul. - Aug. 1984, 11 Jan. 1983 p 495-501 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25574# Joint Publications Research Service, Arlington, Va.
PSYCHOLOGICAL AND PHYSIOLOGICAL BASIS OF STEREOPHONIC EFFECT Abstract Only
A. P. Yefimov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 7 Transl. into ENGLISH from Elektrosvyaz (Moscow), no. 10, Oct. 1984 p 12-16 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-25593# Joint Publications Research Service, Arlington, Va.
ACOUSTIC EMISSION OF SEMICONDUCTOR DEVICES Abstract Only
V. A. Kalitenko, I. Ya. Kucherov, and V. M. Perga *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 58 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Kiev), v. 27, no. 10, Oct. 1984 p 91-92 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N85-26326*# National Aeronautics and Space Administration, Washington, D. C.
DEVELOPMENT OF AN APPARATUS FOR OBTAINING MOLECULAR BEAMS IN THE ENERGY RANGE FROM 2 TO 200 eV
R. Clapier, F. M. Devienne, A. Roustan, and J. C. Roustan Apr. 1985 13 p refs Transl. into ENGLISH of Conf. Paper from Entropie, France p 53-57 Presented at the Intern. Symp. on High- and Medium-Energy Molecular Beams, Cannes, 1-4 Jul., 1969 Original language doc. was announced in IAA as A70-20112 Transl. by The Corporate Word, Inc., Pittsburgh, Pa.
(Contract NASw-4006)
(NASA-TM-77835; NAS 1.15:77835) Avail: NTIS HC A02/MF A01 CSCL 20H

The formation and detection of molecular beams obtained by charge exchange from a low-energy ion source is discussed. Dispersion in energy of the ion source was measured and problems concerning detection of neutral beams were studied. Various methods were used, specifically secondary electron emissivity of a metallic surface and ionization of a gas target with a low ionization voltage. The intensities of neutral beams as low as 10 eV are measured by a tubular electron multiplier and a lock-in amplifier. E.A.K.

N85-26327*# Nebraska Univ., Lincoln. Lab. of Physics.
KINETIC ENERGIES OF FRAGMENT IONS PRODUCED BY DISSOCIATIVE PHOTOIONIZATION OF NO
James A. R. Samson, G. C. Angel, and O. P. Rstgi [1985] 12 p refs
(Grant NGR-28-004-021)
(NASA-CR-175721; NAS 1.26:175721) Avail: NTIS HC A02/MF A01 CSCL 20H

The kinetic energies of ions produced by dissociative photoionization of NO have been measured at the discrete resonance lines of He (584A) and Ne (736A), and with undispersed synchrotron radiation. O sup + ions were identified with energies from 0 to approximately 0.5 eV and two groups of N sup + ions one with energy of 0.36 eV and another with energies between 0.9 and 1.5 eV, apparently produced by predissociation of the C sup 3 P 1 and B'1 sigma states respectively. Author

N85-26328# Dayton Univ., Ohio.
THRESHOLD ELECTRON STUDIES OF GAS-SURFACE INTERACTIONS Final Report, 1 Sep. 1983 - 31 Oct. 1984
P. T. Murray Jan. 1985 20 p
(Grant AF-AFOSR-0260-83)
(AD-A151271; UDR-TR-85-08; AFOSR-85-0212TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

The purpose of this program was to test the feasibility of using Threshold excitation spectroscopy (TES) as a new method of performing surface analysis. The TES experiments entailed bombarding the specimen of interest with a beam of nearly

monoenergetic electrons and detecting those electrons which underwent near total energy loss upon colliding with the target surface. The result of such collision was a scattered electron with a final kinetic energy close to zero. The program involved designing and constructing a threshold electron spectrometer which incorporated a steradiancy filter to selectively detect low energy electrons. The feasibility experiments entailed using lithium fluoride thin films as the test specimen. The resulting threshold excitation spectrum exhibited peaks at 3.5, 4.5, and 6.3 eV; this was in excellent agreement with previous electron transmission studies in which peaks were attributed to optically forbidden excitonic transitions at the lithium fluoride surface. The fact that similar structure was observed in this program (with better energy resolution) demonstrated that TES is indeed a feasible method of performing surface analysis. GRA

N85-26329# Mission Research Corp., Albuquerque, N. Mex.
HIGH CURRENT BEAM HOLLOWING INSTABILITY STUDY Final Technical Report
C. A. Ekdahl Jan. 1985 47 p
(AD-A151301; AMRC-R-671) Avail: NTIS HC A03/MF A01 CSCL 20/8

High current relativistic electron beams propagating in air are subject to a variety of macroscopic resistive instabilities, including hollowing, hose, and filamentation. Although the hose instability typically dominates experiments, computer simulations indicate that hollowing is potentially very disruptive to fast current risetime beams, especially at low air density. There have, been at least three experiments which exhibited the hollowing instability clearly. Results from the last of these, performed using the 4 MeV, 70 kA IBEX beam generator, are analysed. The instability occurs routinely in computer simulations for beam currents above 17 kA and risetimes less than a few ns in full density air, and over broader parameter ranges at reduced air densities. It develops rapidly in the beam nose and is highly disruptive. Although emittance tailoring and electron energy spread can raise the threshold for the onset of hollowing, the stability of high current beams against hollowing can be assured only by maintaining a sufficiently long current risetime. A series of three high current beam experiments have been performed to confirm this theoretical picture of the hollowing instability. GRA

N85-26330# Materials Research Labs., Ascot Vale (Australia).
CALCULATIONS OF COLLISION-INDUCED OPTICAL GAIN IN HIGH-DENSITY MIXTURES OF D2 OR HD WITH A BUFFER GAS
R. McLeary Oct. 1984 32 p
(AD-A151372; MRL-R-939) Avail: NTIS HC A03/MF A01 CSCL 20/8

This report presents the results of calculations of collision-induced optical gain in vibrationally-excited mixtures of deuterium or hydrogen deuteride with a buffer gas. Gains of up to 0.07/cm are predicted for gas mixtures at high pressure and reduced temperature. Significant gain is predicted over a frequency range of approximately 2100/cm to 2700/cm (wavelength range 4.8 to 3.7 micrometers) for D2 mixtures and over the frequency range 2600/cm to 3300/cm(wavelength range 3.8 to 3.0 micrometers) for HD mixtures. These results indicate the feasibility of operation of collision-induced-dipole lasers which are continuously tunable over the above frequency ranges. GRA

N85-26331# Naval Research Lab., Washington, D. C.
BEAM TRAPPING IN HIGH CURRENT CYCLIC ACCELERATORS WITH STRONG FOCUSING FIELDS Memorandum Report, Jan. - Dec. 1984
P. Sprangle and C. A. Kapetanakos 6 Mar. 1985 23 p
(AD-A151392; NRL-MR-5458) Avail: NTIS HC A02/MF A01 CSCL 20/7

In cyclic induction accelerators, the energy of the particles increases slowly in synchronism with the vertical (betatron) magnetic field. As a consequence of the slow acceleration, the charged particles must be confined by the weak focusing magnetic field over long periods of time, and thus field errors, instabilities and radiation losses can impose limitations on the acceleration process. These limitations can be substantially relaxed if the acceleration were to occur rapidly, say over a few microseconds. An appropriate name for such an accelerator is REBA-TRON (Rapid Electron Beam Accelerator). This paper considers a possible mechanism which could trap a high current electron beam in the strong focusing magnetic fields of the rebatron. We investigate a possible mechanism for trapping an intense relativistic electron beam confined by strong focusing fields. In our model the electron beam is assumed to be injected into torsatron fields off axis, near the chamber walls. The finite resistivity of the walls results in a drag force on the beam centroid which may cause the beam to spiral inward towards the axis of the chamber. We have analyzed this mechanism and obtained decay rates for the inward spiraling beam motion. GRA

N85-26332# Mission Research Corp., Albuquerque, N. Mex.
MODIFIED BETATRON ACCELERATOR STUDIES Final Report
T. P. Hughes and B. B. Godfrey Dec. 1984 117 p
(Contract N60921-84-C-0078)
(AD-A151420; AMRC-R-655) Avail: NTIS HC A06/MF A01 CSCL 20/7

This final report describes work carried out on the equilibrium and stability properties of circular accelerators. A rigid-disk beam model in which the fields are treated exactly is used to study linear instabilities. This approach has uncovered an important inductive effect which at high toroidal mode numbers leads to either stability or to a hybrid instability. A corresponding effect has been found in electron-layer geometry. The new theory also shows that moving the equilibrium position toward the inner wall can stabilize low mode numbers. With the aid of IVORY code simulation results it is shown that the transverse motion of beam particle is a key factor in determining beam stability. The upper bound on particle circulation frequency spread is shown to be a function only of the beam major and minor radii. This leads to upper bounds on stable currents in the modified betatron. Numerical results on stability in the stellatron and reversing-solenoidal-lens betatrons are presented. In addition, the sensitivity of equilibrium particle orbits in the stellatron to initial conditions is calculated. GRA

N85-26333# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
MICROWAVE EMISSION FROM RELATIVISTIC ELECTRON BEAMS Interim Scientific Report, 1 Nov. 1983 - 31 Oct. 1984
G. Bekefi 27 Nov. 1984 40 p
(Grant AF-AFOSR-0026-84)
(AD-A151472; AFOSR-85-0236TR) Avail: NTIS HC A03/MF A01 CSCL 20/8

A free electron laser experiment is currently underway in which a 1kA, 2.1MeV electron beam is excited by a helical wiggler field of 2 cm periodicity to produce submillimeter radiation at wavelengths between 400 and 600 micrometers. This experiment will operate in the high gain Raman regime with a maximum calculated output power at saturation of approximately 50MW. This free electron laser is unique in two respects. First, the electron beam will be transported through the wiggler with the aid of two short solenoidal focussing lenses. This system obviates the need for strong uniform guiding magnetic field in the interaction region thereby insuring that the cyclotron maser quality is not excited. Second, this FEL employs a very high quality electron beam. The beam is produced in a multielectrode electron gun which uses a cold field emission cathode. The gun consists of a planar cathode and anode grid followed by four accelerating stages. The accelerating electrodes are shaped to provide electrostatic focussing by balancing the self-electric and magnetic fields of the beam. GRA

N85-26334# SRI International Corp., Menlo Park, Calif.
KINETICS AND STRUCTURE OF EXCITED STATES Final Report
T. F. Gallagher Jan. 1985 10 p

(Contract F49620-79-C-0212)
(AD-A151902; SRI-MP-85-005; AFOSR-85-0257TR) Avail: NTIS HC A02/MF A01 CSCL 20/8

The objective of this research program was to reach an understanding of excited atom processes by a systematic experimental study of their spectroscopy, interactions with strong fields, and collisions. The method used is laser excitation of excited atoms in conjunction with a variety of state selective detection techniques developed in our laboratory. Although it is unusual to study spectroscopy and collisions in the same research program, it has proved to be a very enlightening approach. This report summarizes the accomplishments. For reference, a list of the scientific papers published under this contract is included. These papers embody the main conclusions of our study. GRA

N85-26335# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.
TWO-BEAM ACCELERATOR
F. B. Selph Sep. 1984 24 p refs Presented at the 3rd Ann. Summer School on High Energy Accelerators, Stony Brook, N.Y., 6 Jul. 1983
(Contract DE-AC03-76SF-00098)
(DE85-004662; LBL-18403; CONF-8307126-2) Avail: NTIS HC A02/MF A01

In the two-beam accelerator (TBA) concept, an electron linear accelerator structure is established in which two beams propagate. One is an intense low energy beam that is made to undergo free electron lasing to produce microwaves. These microwaves are then coupled to another part of the structure where they act to produce a high longitudinal electric gradient that is used to accelerate a second relatively low intensity electron beam to very high energies. The TBA was originally suggested as a possible means for economically achieving linear collider energies of 100 GeV and above. Although still in a conceptual stage, the TBA is an inherently plausible concept that combines the free electron laser (FEL) with several well-known technologies - high current induction linacs, microwave waveguides, and traveling-wave linac structures. Two characteristics of the TEA that make it a particularly suitable candidate for achieving high energies are its ability to operate at higher frequencies than typical present-day linacs (say 30 GHz as compared with 3 GHz), and to be an efficient means for delivering power to a hitherto unattainable high-gradient structure (say 250 MV/m). DOE

N85-26336# Sandia Labs., Albuquerque, N. Mex.
NUCLEAR RADIATION INDUCED ABSORPTION IN OPTICAL MATERIALS
P. J. Brannon and R. W. Morris Jan. 1985 33 p refs
(Contract DE-AC04-76DP-00789)
(DE85-007128; SAND-84-2437) Avail: NTIS HC A03/MF A01

Reactor radiation-induced transient absorption was measured in 7940 fused silica, magnesium fluoride, barium fluoride and sapphire at 257 n. The fused silica gave the lowest induced transient absorption of all the materials studied. The absorption coefficient per unit dose for fused silica (1.5 cm(-1)/Mrad) was much more than the value given previously in the literature. The previously measured value was at a temperature of 500 C, suggesting that the induced transient absorption can be greatly reduced by elevating the temperature of the sample. The absorption coefficient per unit dose was also found to be dose rate dependent. DOE

N85-26337# Brookhaven National Lab., Upton, N. Y.
SPECTROSCOPY OF QUASIMOLECULAR X-RAYS WITH H-LIKE DECELERATED IONS
H. Schmidt-Boecking (Frankfurt Univ., West Germany), R. Schuch (Heidelberg Univ., West Germany), I. Tserruya (Weismann Inst. of Science, Rehovoth, Israel), R. Hoffmann (Heidelberg Univ., West Germany), B. Johnson, K. W. Jones, E. Justiniano (Heidelberg Univ., West Germany), M. Meron, P. H. Mokler, H. Ingwensen (Max-Planck-Inst. fuer Kernphysik, Heidelberg, West Germany) et al Nov. 1984 21 p refs Presented at the 8th Conf. on the Application of Accelerators in Res. and Industry, Denton, Tex., 12 Nov. 1984
(Contract DE-AC02-76CH-00016)
(DE85-006565; BNL-35643; CONF-841117-44) Avail: NTIS HC A02/MF A01

The quasimolecular 2p(Pl)-1s tau transition energy as a function of the internuclear distance is obtained from the interference structure observed in quasimolecular K-X-ray spectra from low energy H-like projectiles measured at certain impact parameters. DOE

N85-26338# California Univ., Los Angeles. Dept. of Mechanical Aerospace and Nuclear Engineering.
RADIATION EFFECTS ON STRUCTURAL MATERIALS Technical Progress Report for period ending 1 Jan. 1985
Nasr M. Ghoniem 1985 11 p
(Grant DE-FG03-84ER-52110)
(DE85-007032; DOE/ER-52110/T2) Avail: NTIS HC A02/MF A01

Results of calculations for 2 1/4Cr-1Mo are shown. Comparison is made between the model calculations and experiments for the allowable stress to 1% strain. Figure shows the effects of stress variations on creep strain. The effects of irradiation at 30 dpa/year on allowable design stresses are shown; irradiation results in a loss of 20 to 30 MPa, in order to have the same lifetime. DOE

N85-26339# Fermi National Accelerator Lab., Batavia, Ill.
MEAN FREE PATHS, VISCOSITY, AND THE LIMITATIONS OF PERFECT FLUID HYDRODYNAMICS IN THE DESCRIPTION OF THE QUARK-GLUON PLASMA
Larry McLerran Nov. 1984 10 p refs Presented at the Local Equilibrium in Strong Interactions Phys. Meeting, Bad Honnef, West Germany, 1 Sep. 1984
(Contract DE-AC02-76CH-03000)
(DE85-005501; FNAL/C-84/128-T; CONF-8409204-1) Avail: NTIS HC A02/MF A01

The applicability of a hydrodynamic description of high energy hadronic collisions is discussed. The results of recent computations of the mean free paths of quarks and gluons in a quark-gluon plasma, and the corresponding results for viscous coefficients were reviewed. These quantities are employed to evaluate the limits to the application of perfect fluid hydrodynamics as a description of time evolution of matter produced in various hadronic collisions. DOE

N85-26340# Oak Ridge National Lab., Tenn.
MANY-ELECTRON EFFECTS IN ELECTRON IMPACT IONIZATION OF MULTIPLY CHARGED IONS
R. A. Phaneuf 1984 20 p refs Presented at the 2nd Intern. Workshop on Cross Sect. for Fusion and Other Appl., College Station, Tex., 8-10 Nov. 1984 Submitted for publication
(Contract DE-AC05-840R-21400)
(DE85-005570; CONF-8411142-1) Avail: NTIS HC A02/MF A01

Many-electron phenomena critically influence the ionization of multiply charged ions by electron impact. In general, inner-shell electrons play an increasingly important role in the electron-impact ionization process as the ionic or nuclear charge increase along an ionic sequence. A few specific examples are given to illustrate the signature and relative contributions of a number of indirect ionization mechanisms to the total ionization cross sections. Author

N85-26341# Stanford Linear Accelerator Center, Calif.
ENERGY DEPENDENCE OF THE EMITTANCE OF DAMPING RING BEAMS
R. Stiening 4 Jan. 1985 5 p
(Contract DE-AC03-76SF-00515)
(DE85-007080; SU-SLAC-CN-285) Avail: NTIS HC A02/MF A01

The energy at which the SLC damping rings are operated was chosen to be 1.21 GeV. At the time that that specification was made, the repetition rate of the SLC was expected to be 180 Hz. It is now anticipated that the repetition rate during the initial year of operation of the SLC was expected to be 180 Hz. It is now anticipated that the repetition rate during the initial year of

operation of the SLC will be 120 Hz. Curves show the output emittance of the damping rings as a function of input emittance and energy which suggests that there is a range of energies over which the rings can be operated without changing the SLC luminosity. It is noted that in the era of polarized beams, the damping ring energy will be fixed at the design value on account of the spin precession required in the LTR and RTL transport lines. The SLC design output emittance of the damping rings is 3 x 10(-5) radian-meters. Because of space charge disruption and quantum emission downstream of the damping rings, much lower values than the design value may not have a large beneficial effect on the luminosity. DOE

N85-26342# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ATOMIC PHYSICS ASPECTS OF A RELATIVISTIC NUCLEAR COLLIDER
Harvey Gould Nov. 1984 14 p refs
(Contract DE-AC03-76SF-00098)
(DE85-006867; LBL-18593) Avail: NTIS HC A02/MF A01

Important atomic physics effects and interesting experiments involving a relativistic nuclear collider were examined. Atomic collision cross sections involving bare uranium nuclei are large at relativistic energies and will affect the design and operation of a relativistic nuclear collider (RNC). The most significant may be production of electron-positron pairs and muon pairs (approx. = 10(8) per sec and 2000 per sec, respectively, for a 100 GeV/ nucleon collider ith a luminosity of 10*@&) cm(2)s(-1)). The pair production is a direct measure of the luminosity and its is a large source of background and capture of an electron from the pair by one of the nuclei will result in the loss of the ion. An important loss mechanism is Coulomb excitation of the giant nuclear dipole and giant nuclear quadrupole resonances. Storing and colliding bare and highly-stripped uranium opens up new possibilities for novel atomic physics experiments and an alternate approach for present experiments. The use of a collider for experiments to study spontaneous decay of the supercritical state of quasiatoms of atomic number $Z > 172$, and a storage-ring measurement of the ground state hyperfine structure of hydrogenlike thallium as a test of quantum electrodynamics (QED) are discussed. DOE

N85-26343# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany). Hauptabt. Vorprojekte und Studien.
STUDY ON THE EXTENSION OF EXPERIMENT RESOURCES IN THE MAUS PROJECT Final Report, Nov. 1983
Horst Anderle, Guenther Boerchers, Guenther Fechner, Volker Groth, Bernd Haase, Heinz Stolze, and Peter Vits Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 61 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-051; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12

Concepts for the extensions of the MAUS-experiment-resource-limits were analyzed. The limits for the experiment parameters such as volume, mass, energy and dissipation are increased by connecting several get away special (GAS) containers to MAUS-clusters. The analyzed concepts are discussed and for one selected concept the development phase are prepared by the design of hardware, by electronic layouts and by planning of the procurement (with working scheme and schedule). Author (ESA)

N85-26311# Joint Publications Research Service, Arlington, Va.
BREAKTHROUGH IN CONTAINER CONFINEMENT OF ULTRA-COLD NEUTRONS
V. Okolotin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 38-39 Transl. into ENGLISH from Moskovskiy Komsomlets (Moscow), 3 Oct. 1984 p 4 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N85-26344# Argonne National Lab., Ill.
PHYSICS EFFECTS OF ACCIDENTAL SUBMERSION OF SPACE POWER REACTORS IN WATER
S. K. Bhattacharyya and R. M. Lell 1985 28 p refs Presented at the 2nd Symp. on Space Nucl. Power Systems, Albuquerque, N. Mex., 14 Jan. 1985
(Contract W-31-109-eng-38)
(DE85-005020; CONF-850103-5) Avail: NTIS HC A03/MF A01

A major safety concern for nuclear reactors in space power applications is the effect of accidental submersion of the reactors in water. Such a situation might be postulated, for example, as a consequence of a launch pad accident. The classes of reactors proposed most frequently for use in space are fast spectrum reactors, for which submersion results in a softened core neutron spectrum caused by the displacement of the liquid metal coolant by the water. The softened spectrum alters the neutron balance in the core neutron capture and fission are increased while leakage from the core is reduced. Water outside the submerged core introduces an increased number of reflected thermalized neutrons into the core. The net effect is a function of the specific features of the reactor design (composition, size, etc.) and can be positive or negative depending upon the contributions of the individual effects. The purpose is to develop generic features of teh submersion phenomenon to provide designers a means to an a priori knowledge of the impact of potential design choices on submersion reactivity. DOE

N85-26345# Sandia Labs., Albuquerque, N. Mex.
SPACE REACTOR GROUND TESTS, ASSESSMENT OF FACILITY NEEDS
J. S. Philbin and R. P. Wemple 1985 5 p refs Presented at the 2nd Symp. on Space Nucl. Power Systems, Albuquerque, N. Mex., 14 Jan. 1985
(Contract DE-AC04-76DP-00789)
(DE85-006814; SAND-85-00990; CONF-850103-7) Avail: NTIS HC A02/MF A01

Facility requirements for previously-specified, space-reactor ground tests of operating reactor prototypes are discussed. Also presented are engineering development tests applicable to fully-integrated space reactors and their subsystems. The development tests were derived by considering the functions and environments that the reactor might encounter in normal or abnormal launch-to-recovery sequences. Surety (safety, safeguards, and reliability) priorities will influence the final character of both the test program and the facilities requirements. Sandia facilities suitable for conducting the above tests are the main focus. DOE

N85-26346# Brookhaven National Lab., Upton, N. Y.
FUTURE ACCELERATOR STUDIES OF HIGH ENERGY HEAVY ION COLLISIONS
T. w. Ludlam 1984 9 p refs Presented at Workshop on Cosmic Ray and High Energy Gamma Ray Exptn. for the Space Station, Baton Rouge, La., 17 Oct. 1984
(Contract DE-AC02-76CH-00016)
(DE85-005885; BNL-35801; CONF-8410206-2) Avail: NTIS HC A02/MF A01

The possibility of the long distance aspects of quantum chromodynamics (QCD) is explored in very high energy nuclear collisions: elementary properties of the strong interaction, the structure of the QCD vacuum, and the mechanism of quark confinement in hadrons is addressed through the macroscopic behavior of nuclear matter at extreme conditions of temperature and baryon density; specifically, extended volumes of hadronic matter with energy densities greater than 10 times that of the nuclear ground state. The possibility of creating such conditions

in laboratory experiments with ultra relativistic heavy ion collisions has attracted increasing numbers of nuclear and particle physicists. The discovery nd exploration of a new form of matter consisting of an extended plasma of quarks and gluons embraces the interests and techniques of both these communities, with important consequences for astrophysics as well. The status of efforts to realize the high energy nuclear beams required to do these experiments is summarized, and the experimental programs which are being planned are described. DOE

74 OPTICS

Includes light phenomena.

N85-26347 British Aerospace Dynamics Group, Bristol (England). Human Factors Dept.
OPTICAL FLOW-PATTERNS OF IMAGE VELOCITY AND THEIR POTENTIAL USE IN GUIDANCE AND IMAGE INTERPRETATION
P. A. Stanley Aug. 1981 17 p refs
(BAe-BT-12091) Copyright. Avail: Issuing Activity

Optical flow, i.e., the pattern of image velocities created when an observer/sensor moves through the environment is introduced. The temporal optical array of a moving point of observation contains sufficient information (in conjunction with a scaling factor) to extract the ranges of objects in the environment. The applicability of such information to missile guidance is considered. Although the utility of optical flow concepts strongly depends on missile attitude, sensor angle and accuracy of object tracking, a further analysis of specific cases and potential algorithms is worthwhile. It is shown that dynamic images are a source of considerable information of value of an automatic interpretation system. The optical flow fields of solid objects moving relative to an observer/sensor have characteristics useful in frame-to-frame edge tracking, edge to object assignment and target background separation. Author (ESA)

N85-26348 British Aerospace Dynamics Group, Bristol (England). Optics Research Dept.
AN INVESTIGATION INTO GENERALISED MATCHED FILTER TECHNIQUES
J. S. Anderson and P. F. Sims Jun. 1982 31 p refs
(BAe-BR-12971) Copyright. Avail: Issuing Activity

A method of constructing an optical correlation system for detection of targets independent of range is described. Digital simulations show good correlation between targets that differ by a scale factor of two, and thus the need for multiple matched filters for different target ranges is reduced. An optical element to perform the logarithmic transform required in the modified optical correlation system is outlined. The method is only effective if the targets are aligned properly. Author (ESA)

N85-26349*# Arizona Univ., Tucson. Optical Sciences Center.
DESIGN OF A VARIABLE-FOCAL-LENGTH OPTICAL SYSTEM Final Report
Douglas Ricks and Robert R. Shannon 15 Sep. 1984 93 p refs Prepared for JPL
(Contract JPL-955678)
(NASA-CR-175710; JPL-9950-1052; NAS 1.26:175710) Avail: NTIS HC A05/MF A01 CSCL 20F

Requirements to place an entire optical system with a variable focal length ranging from 20 to 200 cm within a overall length somewhat less than 100 cm placed severe restrictions on the design of a zoom lens suitable for use on a comet explorer. The requirements of a wavelength range of 0.4 to 1.0 microns produced even greater limitations on the possibilities for a design that included a catadioptric (using mirrors and glass) front and followed by a zooming refractive portion. Capabilities available commercial zoom lenses as well as patents of optical systems are reviewed. Preliminary designs of the refractive optics zoom lens and the catadioptric system are presented and evaluated. Of the two, the latter probably has the best chance of success, so long as the shortest focal lengths are not really needed. A.R.H.

N85-26350# Arizona Univ., Tucson. Digital Image Analysis Lab.
FEASIBILITY STUDIES OF OPTICAL PROCESSING OF IMAGE BANDWIDTH COMPRESSION SCHEMES Annual Report
B. R. Hunt and R. H. Strickland 15 Jul. 1984 61 p
(Grant AF-AFOSR-0170-81)
(AD-A151254; DIAL-84-00-4; AFOSR-85-0179TR) Avail: NTIS HC A04/MF A01 CSCL 20/6

Research consists of several distinct and separate activities. The separate research efforts are unified by a common theme: the application of optical processing for image bandwidth compression. Within this common theme, however, the separate research projects are not completely related to each other. Therefore, this report is put together, literally, as a number of independent reports. The separate sections of the report, which follow this section, are intended to be read separately and independently of any other section. Each section has its own references and its own figure labellings, for example. The separate sections of this report, and the research problems dealt with in each section, are summarized in the following: (1) Data compression by multi-spectral staggered sampling, and data reconstruction by spatial and spectral interpolation; (2) Data compression by optical tomography, with data reconstruction by optical convolution and back projection; (3) Adaptive data compression by spatial transformations to create a spatially stationary image; and (4) Improvement of the optical data compression method known as IDPCM. GRA

N85-26351# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
A CALORIMETRIC APPROACH FOR MEASURING EMITTANCE AND NORMAL SPECTRAL ABSORPTANCE AT ELEVATED TEMPERATURES
F. Izaguirre and L. Fishman 28 Jan. 1985 28 p
(Contract F04701-83-C-0084)
(AD-A151292; TR-0084A(5935-04)-3; SD-TR-84-59) Avail: NTIS HC A03/MF A01 CSCL 20/6

A differential calorimeter designed to measure total hemispherical emittance and normal spectral absorptance as a function of temperature is described. The mathematical analysis necessary to calculate both of these parameters is presented. The experimental results obtained with a sample of SiC/A1203 (silicon carbide/alumina) are discussed. It was found that the emittance of SiC/A1203 is 1 at 200 deg C and decreases to about 0.81 at 700 deg C. The absorptance of CO2 CW laser radiation (10.6 micrometers) is 0.85 and remains constant within the range of 600 to 700 deg C. GRA

N85-26352# IBM Research Lab., San Jose, Calif.
OPTICAL MONITORING OF PHOTO-ACOUSTIC PULSE PROPAGATION IN SILICON WAFERS
H. Sontag and A. C. Tam 15 Feb. 1985 18 p
(Contract N00014-83-C-0170)
(AD-A151333; TR-17) Avail: NTIS HC A02/MF A01 CSCL 09/1

The technique of photo acoustic (PA) pulse generation and detection has been used by many workers for measuring the elastic and electrical properties of solids. Such work generally involves the use of short laser pulses to produce transient surface or bulk heating and consequent PA pulses. The advantages of PA measurements (compared to conventional acoustic measurements using transducers for generation) are that a single narrow acoustic pulse can be produced, large-amplitude waves can be generated, acoustic waves can be produced in difficult samples like powders or flames and mechanisms of laser-matter interactions can be investigated. Most previous studies for PA monitoring in solids have used transducers for detection. Optical detections have been used for measuring the small buckling due to photo-thermal heating at the incidence position and for measuring the thermal refractive index variations close to the illuminated region; these measurements are really optical monitoring of photo-thermal (PT) heating. An interferometric detection scheme has been employed

to measure PA waveforms in metals. In this letter, we report the use of optical monitoring for totally noncontact and nondestructive detection of a PA pulse produced by a weak laser pulse (approx. or < energy) in opaque solids and show that the PA pulse can be detected up to a propagation distance of several cm. GRA

N85-26353# Ecole Nationale Superieure de Physique, Marseilles (France).
IN SITU THIN FILM MEASUREMENTS Final Report, 15 Oct. 1983 - 15 Oct. 1984
E. Pelletier and H. A. MacLeod 15 Dec. 1984 69 p Prepared in cooperation with Arizona Univ., Tucson Prepared for European Office of Aerospace Research and Development, London
(Grant AF-AFOSR-0024-84)
(AD-A151379; EOARD-TR-85-07) Avail: NTIS HC A04/MF A01 CSCL 20/6

The optical properties of vacuum-deposited thin films were studied in situ during deposition and in air after deposition at the Ecole Nationale Superieure de Physique, Marseille, and at the Optical Sciences Center, University of Arizona, with the objective of a better understanding of aspects of their behavior determined largely by their microstructure. The basic measurements that were made in both institutes were similar, T and R after deposition and T during deposition, both as functions of wavelength in the visible and near infrared. The techniques for reducing the measurements to values of n, k and of inhomogeneity differed in certain respects but the results were similar. The scientific objectives were: (1) The measurement of the optical constants of thin-films in air after deposition. (2) The measurement of the optical constants of thin films in situ. (3) The study of the differences in the measurements under (1) and (2). (4) The study of aspects of the thin-film deposition process affecting the film performance as measured under (1) and (2). (5) The measurement of optical scattering from thin films and its relation with film structure. GRA

N85-26354# Oregon Univ., Eugene. Chemical Physics Inst.
CHARACTERIZATION OF MULTIPHOTON IONIZATION PROCESSES IN THE ULTRAVIOLET Final Report, 21 May 1981 - 20 May 1984
J. T. Moseley 21 Dec. 1984 10 p
(Contract DAAG29-81-K-0117)
(AD-A151427; ARO-18107.1-PH) Avail: NTIS HC A02/MF A01 CSCL 20/6

This report describes results of research directed toward a better understanding of multiphoton ionization (MPI) processes of molecules expected to have large MPI processes in the near ultraviolet region of the spectrum. The motivation for this work was to develop methods of optically controlling diffuse discharges. During the three-year period of this research, such processes were investigated in a variety of molecules, including NO, the methylamines, ferrocene, SO2, and SO. In addition, some work on the use of photodetachment processes to control diffuse discharges was performed in collaboration with researchers at Texas Tech University, and a Workshop on Optical Control of Diffuse Discharges was held at the University of Oregon. The subsequent sections of this report describes the results of this work. GRA

N85-26355# Department of the Air Force, Washington, D.C.
ELECTRON-BOMBARDED SILICON SPATIAL LIGHT MODULATOR Patent Application
D. Armitage, inventor (to Air Force) Filed 8 Jan. 1985 10 p
(AD-D011579; US-Patent-Appl-SN-689681) Avail: NTIS HC A02/MF A01 CSCL 20/6

In electron-bombarded silicon light modulator, leaving a microchannel plate amplifier are accelerated to penetrate a silicon photodiode forming electron-hole pairs therein, resulting in significant current gains. GRA

N85-26356# Department of the Air Force, Washington, D.C.
CHARGE ISOLATION IN A SPATIAL LIGHT MODULATOR Patent Application
D. Armitage, inventor (to Air Force) Filed 8 Jan. 1985 12 p
(AD-D011581; US-Patent-Appl-SN-689699) Avail: NTIS HC A02/MF A01 CSCL 20/6

Basically, spatial light modulators generally comprise a photosensitive substrate or wafer, a light blocking layer, a dielectric mirror and an electro-optic crystal (which may be a liquid crystal), arranged in a sandwich-like composite structure, and having a voltage applied thereacross. A control (write) illumination impinges on the face of the photosensitive semiconductor while an output (read) illumination makes a double pass through the electro-optic crystal. One of the problems encountered in the practical implementation of such spatial light modulators is that of lateral charge transfer in the semiconductor device. By this is meant that the charge formed in the photosensitive semiconductor nearest the electro-optic crystal, resulting in poor spatial resolution. A spatial light modulator having a lattice of microgrooves formed on the surface of the silicon photodiode nearest the electro-optic crystal prevents lateral charge transfer at this surface. GRA

N85-26357# Department of the Air Force, Washington, D.C.
METHOD AND APPARATUS FOR GENERATING A STRUCTURED LIGHT BEAM ARRAY Patent Application
J. Toboada, inventor (to Air Force) Filed 4 Aug. 1983 18 p
(AD-D011590; US-Patent-Appl-SN-520356) Avail: NTIS HC A02/MF A01 CSCL 20/6

An apparatus for simultaneously generating a space volume-filling structural light beam array utilizes a prism assembly which refracts a laser light beam so as to partition it into four separate segments. The four segments produced the two-by-two rectangular beam array by coherent interference of the segments. The present invention broadly relates to analysis of surface topography of an object and, more particularly, is concerned with apparatus and method for generating a space volume-filling structured light beam array for use in non-contact surface metrology of various solid forms. GRA

N85-26358# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
LOW-RESOLUTION TARGET CLASSIFICATION FROM A STARING INFRARED SENSOR M.S. Thesis
J. N. Tilley Dec. 1984 192 p
(AD-A151690; AFIT/GE/ENG/84D-67) Avail: NTIS HC A09/MF A01 CSCL 17/5

A unique method to extract and classify aircraft targets from low-resolution staring infrared data is presented which uses sequences of sensor frames to obtain target signature samples. The classifier is based on a target feature description consisting of X and Y energy projections of the target. The target information is first extracted from sensor data through sampling windows consisting of contiguous rows and columns of detectors in the path of the expected target. The samples are then reduced to remove degradations from noise and sensor optics. The classifier assumes that approximate target position and velocity are available from a target detection and track subsystem. Tests were performed using a software sensor simulation that includes optical blur and sensor motion models. The classifier is shown through simulation to successfully extract and classify various transport and fighter class aircraft with sensor footprint resolution of 11 to 45 meters.
Author (GRA)

N85-26359# Army Missile Command, Redstone Arsenal, Ala. Research Directorate.
RAYLEIGH CRITERIA RESOLUTION OF OPTICAL CORRELATIONS
D. A. Gregory Sep. 1984 20 p
(AD-A151711; AD-E950661; AMSMI/RR-84-10-TR) Avail: NTIS HC A02/MF A01 CSCL 17/8

This report describes an investigation into determining the resolvability between correlations produced by Fourier transform matched filters made of very similar scenes. Knowledge of this type is needed to accurately predict the total number of matched filters needed to completely identify a scene or object regardless of its rotational position. Similar experiments may be done for scale and tilt as the variable. This report introduces the Rayleigh

criteria as the standard by which distinguishability may be measured in a Vander Lugt type optical recognition system. Author (GRA)

N85-26360# Manchester Univ. (England).
STUDIES OF ELECTRO-OPTICAL ATTENUATION IN THE VICINITY OF CLOUD BASE Final Scientific Report, 1 Nov. 1983 - 31 Oct. 1984
J. Latham Dec. 1984 37 p
(Grant AF-AFOSR-0009-84)
(AD-A151745; EOARD-TR-85-06) Avail: NTIS HC A03/MF A01 CSCL 20/6

Field measurements of atmospheric transmission in the 10.6 micron wavelength, the 3-5 micron and the 8-12 micron conducted. EO weapon system designers must design for atmospheric effects predicted by these models. This research helps heric effects predicted by these models. This research helps make improvements to the accuracy required. Field measurements were carried out under various atmospheric conditions including those which affect molecular absorption most. These measurements included the appropriate meteorological and optical parameters. Results of the measurements were used to improve empirically the tansmission models and to develop theoretical models for the cloud base physics. Previous efforts by the principal investigator have provided some improvements to the AF Geophysics Laboratory's transmission models and to the British Ministry of Defence's sensor development program. This research effort enhances understanding of absorption of electromagnetic radiation in the atmospheric windows by pre-cloud aerosols and by molecular action. GRA

N85-26361# Royal Signals and Radar Establishment, Malvern (England). DH578118
A SCANNING OPTICAL MICROPROBE FOR INFRARED DETECTOR MEASUREMENT
H. A. Tarry 1984 29 p
(AD-A151748; RSRE-MEMO-3745; DRIC-BR-94725) Avail: NTIS HC A03/MF A01 CSCL 17/5

An optical probe apparatus is described which has been used for mapping the responsivity and defects of a range of IR detectors and has been extended to measure minority carrier lifetime, ambipolar mobility, photoluminescence and diffusion length. Each use of the apparatus is illustrated with experimental results. Author (GRA)

N85-26362# Defence Research Establishment, Ottawa. (Ontario).
USER MANUAL FOR IMAGER: THE DREO (DEFENCE RESEARCH ESTABLISHMENT OTTAWA) IMAGE PROCESSING SYSTEM
C. Brochu, R. Ball, K. Lim, and S. Sorensen Sep. 1983 113 p
(AD-A151754; DREO-TN-82-16) Avail: NTIS HC A06/MF A01 CSCL 20/6

The purpose of this document is to assist the user of the DREO (Defence Research Establishment, Ottawa) Image Processing System (see AD-A151 752) in the processing of digital images. The system, which includes a minicomputer and a NORPAK Image Processor, is accessed via an easy-to-use menu structure. The manual explains the general purpose of the functions accessed through the menus as well as the subtleties of their uses. GRA

N85-26363# Department of the Air Force, Washington, D.C.
MODE DEPENDENT, OPTICAL TIME DELAY SYSTEM FOR ELECTRICAL SIGNALS Patent Application
A. Yang, inventor (to Air Force) Filed 6 Feb. 1985 23 p
(AD-D011596; US-Patent-Appl-SN-698721) Avail: NTIS HC A02/MF A01 CSCL 20/6

This patent application discloses a mode dependent, optical time delay system for electrical signals having a highly multi-mode optical fiber having a step index profile in optical alignment with an optical source which is capable of converting an incoming electrical signal into an optical signal. By incorporating within the system a number of different components to alter or control the mode angles of the incoming optical signal, the resultant optical output signal is time delayed as it propagates through the optical fiber. This optical output signal is thereafter converted into an electrical output signal which is also time delayed in direct relation to the mode angle of the optical signal propagating through the optical fiber. GRA

N85-26364# California Univ., Livermore. Lawrence Livermore Lab.
THREE NEW FIBER-OPTIC COMPONENTS
R. P. Reedy and F. A. Schumacher 5 Dec. 1984 13 p refs
(Contract W-7405-eng-48)
(DE85-006269; UCRL-53589) Avail: NTIS HC A02/MF A01

Three new fiber-optic components are described: an in-line filter, an optical switch, and an in-line attenuator. The in-line filter inserts an optical filter into any fiber line containing a connector while imposing very little cost in additional power loss. The optical switch allows a single output fiber to transmit input from one of two different fibers and permits switching back and forth between the input fibers as needed. The in-line attenuator attenuates signals in fiber lines over a large range of about -30 dB with infinite variability. All three components are rugged, reliable, accurate, and inexpensive. They were developed for the prompt diagnostics used on underground nuclear tests and have successfully performed in this harsh, demanding environment. DOE

N85-26365# California Univ., Livermore. Lawrence Livermore Lab.
IMAGE FORMATION IN TERMS OF THE TRANSPORT EQUATION
Michael Reed Teague 22 Oct. 1984 39 p refs Presented at the Workshop on Unconventional Imagery, Rigi-Kaltbad-First, Switzerland, 24-28 Sep. 1984; sponsored by ARO Submitted for publication
(Contract W-7405-eng-48)
(DE85-004993; UCRL-91408; CONF-8409197-1) Avail: NTIS HC A03/MF A01

A scheme recovering phase using irradiance data along, without interferometric techniques, is developed using the transport equations for phase and irradiance. For the case of one transverse dimension a general solution, for an arbitrary irradiance distribution, of the transport equation for the optical phase is already given by an application of the divergence theorem. Numerical simulations indicate that the phase recovery scheme works well even in the presence of large pupil plane aberrations if the signal to noise ratio is sufficiently high. In particular pupil plane phase aberrations may be determined from irradiance meassurements in two planes which are near the image plane. DOE

N85-26366# Sandia Labs., Livermore, Calif. Exploratory Chemistry Div.
EXPERIMENTAL AND THEORETICAL STUDY OF THE INFRARED REFLECTANCE OF THIN OXIDE FILMS ON METALS
David K. Ottesen Jan. 1985 42 p refs
(Contract DE-AC04-76DR-00789)
(DE85-005799; SAND-85-8201) Avail: NTIS HC A03/MF A01

External reflectance infrared spectroscopy was used to study the formation of oxide films on chromium and iron alloys. Experimental data were acquired with an FT-IR spectrometer using a polarized beam at high angles of incidence to the surface normal. Theoretical calculations were made for these systems and are compared with the experimental results. Particular attention is given to the quantitative calculation of film thickness. Complications which arise from distortions in band shape, frequency shifts, the appearance of additional reflectance minima, and beam divergence and state of polarization are discussed in detail. DOE

N85-26367# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TECHNICAL EVALUATION REPORT ON AVIONICS PANEL SPECIALISTS' MEETING ON DIGITAL OPTICAL CIRCUIT TECHNOLOGY
Hyatt M. Gibbs (Arizona Univ., Tucson) Loughton, England Feb. 1985 12 p refs

(AGARD-AR-202; ISBN-92-835-1484-X) Avail: NTIS HC A02/MF A01

The research and development status of optical circuit technology is presented and its relevance in the broad context of digital processing, communication, radar, avionics, and flight control implementation is examined. Materials for devices are considered as well as etalons, waveguides, and optics in computers. Recommendations for future efforts are offered. A.R.H.

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N85-26368*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FORCED MHD TURBULENCE IN A UNIFORM EXTERNAL MAGNETIC FIELD Final Report
Murshed Hossain, George Vahala, and David Montgomery Mar. 1985 41 p refs
(Contract NAS1-17070)
(NASA-CR-172576; ICASE-85-24; NAS 1.26:172576) Avail: NTIS HC A03/MF A01 CSCL 20I

Two-dimensional dissipative MHD turbulence is randomly driven at small spatial scales and is studied by numerical simulation in the presence of a strong uniform external magnetic field. A behavior is observed which is apparently distinct from the inverse cascade which prevails in the absence of an external magnetic field. The magnetic spectrum becomes dominated by the three longest wavelength Alfven waves in the system allowed by the boundary conditions: those which, in a box size of edge 2 pi, have wave numbers (kx' ky) = (1, 1), and (1, -1), where the external magnetic field is in the x direction. At any given instant, one of these three modes dominates the vector potential spectrum, but they do not constitute a resonantly coupled triad. Rather, they are apparently coupled by the smaller-scale turbulence. Author

N85-26369# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ANNUAL REVIEW, APRIL 1983 - MARCH 1984
Mar. 1984 256 p refs
(ISSN-0547-1567) Avail: NTIS HC A12/MF A01

Wide and varied programs in plasma physics are discussed. Topics discussed range from the design and construction of a Tokamak device to a wide variety of research experiments. Theoretical and computational research were integrated into experimental undertakings. For individual titles, see N85-26370 through N85-26384.

N85-26370# Nagoya Univ. (Japan).
SCIENTIFIC ACTIVITIES. A: REACTING PLASMA PHYSICS. 1: INTRODUCTION AND OVERVIEW
In its Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 8-19 refs (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

The objectives of the Reacting Plasma Project are to study the physical phenomena which will be observed in a nuclear fusion reacting plasma and to establish basic technologies for achieving a DT reacting plasma with high reliability and safety. G.L.C.

N85-26371# Nagoya Univ. (Japan). Torus Design Group.
OUTLINE OF ALTERNATIVE DESIGN OF R-TOKAMAK
K. Miya (Tokyo Univ.) *In its* Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 20-23 refs (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

The alternative design (high elongation version) of R-Tokamak is described, where PF coils are located inside TF coils. The point of this design is tht the installed capacity of PF coil power supply can be reduced and advanced plasma shapings get feasible from the standpoint of engineering, compared with the second phase design where PF coils are outside TF coils. G.L.C.

N85-26372# Nagoya Univ. (Japan).
PLASMA HEATING
K. Sakurai, O. Kaneko, T. Kuroda, and Y. Oka *In its* Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 26 (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

The injection of intense 120 keV deuterium beams is planned for the R-project; two ion sources with the capability of 120 keV, 75 A 1 sec pulse duration are required for each injector. Prior to the development of the prototype ion source for R-project, a 1/4 scale module ion source of the prototype with the extraction area of 15 x 15 square cm. was manufactured to study the beam optics and the beam extraction characteristics. G.L.C.

N85-26373# Nagoya Univ. (Japan).
SYSTEM FOR LOWER HYBRID CURRENT STARTUP
K. Ohkubo, E. Kako, and T. Watari *In its* Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 33-35 ref (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

The following researches on the plasma diagnostics for R-project have been carried out, based on the general principles established previously: (1) Detailed design of microwave interferometer. (2) Detailed design of far-infrared laser interferometer. (3) Estimation of signal-to-noise ratio in the Thomson scattering system of ruby laser light; after detailed design of it. (4) Detailed design of electron cyclotron emission (ECE) measurements. (4) Investigation of extreme ultraviolet to visible spectroscopy and determination of measuring system specifications. G.L.C.

N85-26374# Nagoya Univ. (Japan).
PREPARATORY EXPERIMENTS. 1: JIPP T-IIU
In its Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 55-57 refs (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

Since the device was upgraded the JTPP T-IIU has been utilized for the studies of (1) toroidal current start-up by means of lower hybrid waves (LHW), (2) Ion Cyclotron Range of Frequency (ICRF) heating, (3) Ion Bernstein Wave (IBW) heating, (4) plasma-wall interactions including electron cyclotron resonance (ECR) discharge cleaning, and (5) developments of various plasma diagnostics. G.L.C.

N85-26375# Nagoya Univ. (Japan).
RADIO FREQUENCY CONTAINMENT
In its Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 79-80 (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

The RFC-XX-M device has an axisymmetric doublecusped magnetic field configuration which consists of a mirror field terminated by an RF-plugged spindle cusp at each end. The distance between the two field-null points is 3 m. The magnetic field strength in full operation is 2.1 T at the line cusp, 3.9 T at the point cusp, 0.35 T at the mirror midplane, and 0.96 T at the mirror throat. To produce plasmas, a rotating type III antenna is installed at the mirror throat and is excited by two 0.4-MW RF oscillators. G.L.C.

N85-26376# Nagoya Univ. (Japan).
HIGH ENERGY BEAM EXPERIMENT
In its Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 97 (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

Experiments in devices named SPAC have demonstrated that several toroidal magnetic configurations are formed by intense relativistic electron beam currents. A toroidal device SPAC-VII was brought into operation. In this device, a configuration like Spherator or Levitron was found. It is generated by a slender electron beam ring which performs the function of the hard core of Spherator. Such a kind of core may be called REB Soft Core. The safety factor q at the periphery of the core was as low as 0.6 and the plasma confinement region extended to about 1 = 1 surface. Therefore, it can be said that experimental evidence of the

realization of Astron-Spherator which had been considered more than years ago was given by this work. G.L.C.

N85-26377# Nagoya Univ. (Japan).
NAGOYA BUMPY TORUS
In its Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 106-107 (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

The first Nagoya Bumpy Torus (NBT) at the Institute was dismounted in November 1981 and the second one was completed in March 1982. The modified Nagoya Bumpy Torus (NBT-1M) was operated based on the experience acquired with the former NBT and some improvements are clearly shown in the increased density (10 to the 13th power/cu cm) and bulk ion temperatures of keV. Major activities in the Nagoya Bumpy Torus in the areas of plasma density, electron and ion temperature, confinement and X-ray diagnostics are summarized. M.G.

N85-26378# Nagoya Univ. (Japan).
BASIC STUDIES. 1: BASIC EXPERIMENTS IN PLASMA PHYSICS
M. Otsuka *In its* Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 126-127 (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

The linear TPD-1 and -2 machines, designed for basic experiments on high density, steady state plasmas, are described. The plasma production process is outlined and electrode characteristics are discussed. With helium as a working gas, the typical plasma density is about 10 to the 14th power/cu cm at a discharge current of 100 A. In addition, the spectroscopic measurement of a steady plasma produced by an intense electron beam is discussed. M.G.

N85-26379# Nagoya Univ. (Japan). Dept. of Electrical Engineering.
BASIC EXPERIMENTS IN PLASMA PHYSICS (TPL)
H. Sugai and S. Kishimoto *In its* Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 134 refs (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

The experimental arrangements and the preliminary results of a study of the oblique propagation of ordinary modes in a magnetized high-density plasma are summarized. In particular, the conversion from the ordinary mode to the extraordinary mode was investigated. The results indicate that with careful adjustment of the microwave injection angle, the ordinary to extraordinary conversion can take place in the appropriate conditions of the density profile. M.G.

N85-26380# Nagoya Univ. (Japan).
HIGH BETA PINCH PLASMA (STP-3(M))
In its Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 138 (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

The project STP-3(M) aims to extend studies of confinement and heating in the reversed field pinch (RFP) to higher plasma current regime. For this purpose, the STP-3(M) device is able to flow about 350 kA of total plasma current which corresponds to 15 MA/sq m of the average current density. The device is composed of toroidal coils, poloidal coils, a shell and a vacuum vessel. The minimum rise time of plasma current is about 0.5 ms. The maximum toroidal magnetic field is 0.5 T and the minimum RFP set-up time is about 0.2 ms. Preliminary studies of RFP plasma using the STP-3(M) device and arrangements for diagnostic tools such as a laser scattering system, an alcohol laser interferometry, soft X-ray measurement systems and spectrometers were carried out. M.G.

N85-26381# Nagoya Univ. (Japan).
HIGH BETA PINCH PLASMA (STP-L)
Kei-ich Hirano and Masao Okamoto *In its* Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 145 ref (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

The STP-L experiment showed that a field reversed configuration (FRC) plasma is rotating from the very early phase of production in a split form; the inner core rotates in a negative way and external part in a positive way. How and why the core plasma acquires the negative angular momentum and the stabilizing effect of the spin on the N-2 instability mode are examined. M.G.

N85-26382# Nagoya Univ. (Japan).
SOFT X-RAY DIAGNOSTICS OF LASER-PRODUCED PLASMAS (HALNA)
S. Morita and J. Fujita *In its* Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 148 refs (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

Spectroscopic studies of X-ray lines from common metallic ions in few- and many-electron systems were carried out using a curved-crystal spectrometer. The X-ray source was a vacuum spark device, which can easily produce high-temperature and high-density plasmas. In a few-electron system the structures of H-like and He-like ions were studied for Ti through Zn elements. In a many-electron system the spectra of K(alpha) and K(beta) lines from partially M-shell-ionized ions were observed for Ti and their satellite lines were found. Additional experiments carried out in order to study Z dependence for the structures of the K(beta) lines from the M-shell-ionized ions are described. M.G.

N85-26383# Nagoya Univ. (Japan).
BASIC RESEARCH ON INERTIAL CONFINEMENT FUSION BY LIMAY-I
In its Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 151 ref (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

The LIMAY-I is a pulse power generator for basic experiments related to inertial confinement fusion (ICF). Major efforts are concentrated on preliminary experiments of the DEIC (direct energy input to compressor for ICF) concept. In DEIC, an ICF pellet is connected to the top of a slender MITL (self-magnetic insulated transmission line) of a high pulse power generator. When a high electric pulse power is directly fed into a vacant space between a shell tamper and its enclosed pellet, electrons emitted from the pellet surface produce a dense hot plasma on the inner surface of the tamper. Photons and plasma particles irradiate the pellet surface and give rise to an effective ablative-driven compression. Experimental results on power transport through a slender coaxial transmission line, and on a micro cylindrical compression give a hopeful prediction. M.G.

N85-26384# Nagoya Univ. (Japan).
PLASMA THEORY AND COMPUTATIONS
In its Ann. Rev., Apr. 1983 - Mar. 1984 Mar. 1984 p 173 (For primary document see N85-26369 15-75)
Avail: NTIS HC A12/MF A01

The general collaboration programs of plasma theory and computation conducted through the Nagoya Institute are described. The programs addressed the following subjects: (1) general fusion theory; (2) theoretical and computational studies of confinement physics: studies on Tokamak and stellerator, efforts for compact toroid, and works pertinent to reversed field pinch, bumpy torus and tandem mirror; (3) theoretical and computational studies on current drive, wave heating, and relevant problems; (4) fundamental problems in plasma theory: MHD turbulence, non-linear wave phenomena, and high density charged particle system; and (5) works in related fields as astrophysical plasma physics, stellar dynamics, and molecular dynamics. M.G.

N85-26385# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PROPAGATION OF WAVE PACKET IN A DISSIPATIVE DIELECTRIC MEDIUM
M. Tanaka, M. Fujiwara, and H. Ikegami Dec. 1984 29 p refs (IPPJ-710) Avail: NTIS HC A03/MF A01

Propagation of a wave packet in a dissipative dielectric medium is studied as an initial value problem. The asymptotic behavior of

Gaussian shaped wave packet is examined by using the saddle point method. Particular interest is given to the velocity of wave packet defined by x/t (x: observing position, t: arriving time of peak amplitude) and the group velocity, which shows a sharp maximum or even be infinite in the absorption medium. It is found that the velocity of wave packet decreases in the absorption region in contrast to the group velocity which increases there. It is also found that the packet deformation causes an anomalous propagation, that is, the velocity of amplitude maximum appears to be faster than the light velocity. The fast propagation is shown to change into the slow propagation characterized by the packet velocity less than the light speed. B.W.

N85-26386# Nagoya Univ. (Japan). Inst. of Plasma Physics.
HEAVY ION BEAM STUDY OF POTENTIAL FORMATION IN BUMPY TORUS PLASMA
Keiichi Takasugi Jan. 1985 74 p refs
(IPPJ-711) Avail: NTIS HC A04/MF A01

A heavy ion beam probes is constructed for the study of plasma confinement in Nagoya Bumpy Torus (NBT-1/1M). The measurement of the local plasma potential as well as the electron density profile is possible with good spatial (1 approx. 2 cm) and temporal (approx. 1 msec) resolutions. The feedback controlled detection technique and the time resolved fast detection technique are coupled to use, which enables us to measure local potential reliably even in the pulsed experiments. The process of the development of concentric equipotential surface is observed. The cold and collisional plasma in bumpy torus is not in the equilibrium (C-mode), and the vertically polarized potential profile is produced by the toroidal drift. With the growth of warm collisionless electron component, the polarization is poloidally short circuited, and the concentric equipotential surface is developed. The concentric negative potential well and its positive rim are observed in the standard operation. B.W.

N85-26387# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ASYMMETRIC FLUX GENERATION AND ITS RELAXATION IN REVERSED FIELD PINCH
H. Arimoto, S. Masamune, A. Nagata, K. Ogawa, S. Yamada, A. Matsuoka, H. Sindo, H. Oshiyama, K. Tamaru, and K. I. Sato Feb. 1985 14 p refs
(IPPJ-712) Avail: NTIS HC A02/MF A01

The toroidally asymmetric flux enhancement (dynamo effect) and the axisymmetrization of the enhanced fluxes that follows in the setting up phase of reversed field pinch are investigated on the STP-3(M) device. A rapid increase in the toroidal flux generated by the dynamo effect is first observed near the poloidal and toroidal current feeders. Then, this inhomogeneity of the flux propagates toroidally towards the plasma current. The axisymmetrization of the flux is attained just after the maximum of plasma current. The MHD activities decrease significantly after this axisymmetrization and the quiescent period is obtained. Author

N85-26388# New South Wales Univ., Kensington (Australia).
DIRECT ELECTRON AND ION FLUID COMPUTATION OF HIGH ELECTROSTATIC FIELDS IN DENSE INHOMOGENEOUS PLASMA WITH SUBSEQUENT NONLINEAR OPTICAL AND DYNAMICAL LASER INTERACTION Thesis. Abstract Only
Paraskevas Lalousis 1983 3 p
Avail: NTIS HC A02/MF A01

The nonthermal direct electrodynamic interaction between laser energy and a fully ionized plasma is studied with emphasis on the action of the ponderomotive forces, in which the optical electromagnetic fields act on the plasma electrons which then transfer their energy to the ions electrostatically. The plasma is treated as two separate conducting fluids for electrons and ions, coupled by momentum and Coulomb interactions. The electrostatic fields are derived from Poisson's equation in a dynamically changing state. The generation of cavitons is numerically observed. It is shown that charge neutrality is not necessarily maintained in a caviton. A.R.H.

N85-26389# Naval Research Lab., Washington, D. C.
EFFECTS OF FINITE CURRENT CHANNEL WIDTH ON THE CURRENT CONVECTIVE INSTABILITY Memorandum Report, Oct. 1983 - Oct. 1984
P. Satyanarayana and J. Chen 5 Mar. 1985 39 p
(RR0-3302; S99-QMXB)
(AD-A151414; NRL-MR-5494) Avail: NTIS HC A03/MF A01 CSCL 20/9

The effects of the finite current channel width on the current convective instability are studied both analytically and numerically. First, using a sharp-boundary field-aligned current distribution which has a finite width along the plasma density gradient, the dispersion relation is obtained analytically. Numerical results are also presented for a diffuse-boundary current velocity distribution. Applications to the high latitude ionosphere are discussed. GRA

N85-26390# Cornell Univ., Ithaca, N.Y. Dept. of Structural Engineering.
STABILITY AND VIBRATIONS OF INTERNAL WINDINGS OF HIGH-CURRENT SUPERCONDUCTING SOLENOID MAGNETS
K. Hara and F. C. Moon Dec. 1984 168 p
(Contract N00014-79-C-0224)
(AD-A151465) Avail: NTIS HC A08/MF A01 CSCL 20/9

High field solenoid magnets may experience internal damage or eventually collapse due to the powerful magnetic fields they produce. Elastic deformations of the conductor and insulation in these magnets deserve attention because they can cause local damage that can lead to electrical breakdown. In conventional stress analysis of cylindrically wound magnets, the magnetic field gradient, or magnetic stiffness, is usually neglected. However, in this thesis the magnetic stiffness is shown to have a significant effect on the elastic stability and vibration of these magnets. One-turn and multi-turn superconducting rings were used to study the effects of deformations on stability and vibration. Both static and dynamic methods were used to determine the critical buckling currents. The dispersion of natural frequencies with increase in current and subsequent in-plane and out-of-plane buckling of the rings near the critical buckling current were observed. A model based on ring theory and magnetic stiffness was developed to explain experimental observations and showed a fair to good agreement between experimental and theoretical values of the buckling current. This model was used to evaluate the buckling current of 7- and 10-turn magnets. The analysis showed buckling concentrated in the outer turns. Author (GRA)

N85-26391# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
TIME DEPENDENT AND STEADY-STATE SOLUTIONS OF THE ELECTRON ENERGY DISTRIBUTION IN A WEAKLY IONIZED GAS SUBJECT TO AN ac OR dc ELECTRIC FIELD M.S. Thesis
T. M. Ruoff Dec. 1983 110 p
(AD-A151829; AFIT/GEP/83D-11) Avail: NTIS HC A06/MF A01 CSCL 09/2

The thesis develops a computer code capable of yielding time dependent and steady-state solutions for the electron energy distribution of a weakly ionized gas subject to an external ac or dc electric field. Analytic steady-state solutions for a gas exhibiting no inelastic electron collisional cross sections are derived. Development of a Boltzmann code is described and the results of the code are compared to the analytic steady-state solutions. With the inclusion of inelastic collisions a comparison with previous results for nitrogen is described. It is found that the developed code is capable of yielding the time dependent and steady-state electron energy distribution for a weakly ionized gas. Recommendations for continued research in this area are offered. GRA

N85-26392# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
EFFECTS OF MAGNETIC SHEAR ON LOWER HYBRID WAVES IN THE SUPRAURORAL REGION Final Report, 1 Apr. 1983 - 31 Mar. 1984
P. Bakshi Jan. 1985 19 p

(Grant AF-AFOSR-0112-83)
(AD-A151980; AFOSR-85-0251TR) Avail: NTIS HC A02/MF A01 CSCL 20/9

Effects of magnetic shear on lower hybrid modes are investigated. It is shown that due to non-local effects, even a small shear can significantly affect the instability, leading to stabilization for some parameter ranges. These results are of importance in the context of the recently proposed mechanism of lower hybrid acceleration and ion evolution in the supraurolar region. GRA

N85-26393# California Univ., Livermore. Lawrence Livermore Lab.
EQUATIONS OF STATE OF STRONGLY COUPLED PLASMA MIXTURES
H. E. DeWitt 31 Oct. 1983 23 p refs Presented at International and Workshop on Radiative Properties of Hot Dense Matter, Sarasota, Fla., 31 Oct. 1983 Submitted for publication
(Contract W-7405-eng-48)
(DE85-006163; UCRL-90357; CONF-8310178-6) Avail: NTIS HC A02/MF A01

Therodynamic properties of strongly coupled (high density) plasmas of mixtures of light elements have been obtained by Monto Carlo simulations. For an assumed uniform charge background the equation of state of ionic mixtures is a simple extension of the one-component plasma EOS. More realistic electron screening effects are treated in linear response theory and with an appropriate electron dielectric function. Results have been obtained for the ionic pair distribution functions, and for the electric microfield distribution. DOE

N85-26394# Los Alamos Scientific Lab., N. Mex.
INTERNAL FIELD PROBING OF TRANSLATING FRCS
W. T. Armstrong, R. E. Chrien, and R. D. Milroy (Mathematical Sciences Northwest, Inc., Bellevue, Wash.) Nov. 1984 5 p refs Presented at the Japan/US Joint Symp. on Compact Toroid Res., Hiroshima, 13-15 Nov. 1984
(Contract W-7405-eng-36)
(DE85-003732; LA-UR-84-3575; CONF-8411111-4) Avail: NTIS HC A02/MF A01

Magnetic field probes were employed to study the internal field structure of Field-Reversed Configurations (FRCs) translating past the probes in the FRX-C/T device. Internal closed flux surfaces can be studied in this manner with minimal perturbation because of the rapid transit of the plasma (translation velocity v/sub z/ approx. 10 cm/(MU)s). Data were taken using a 5-mtorr-D2 gas-puff mode of operation in the FRC source coil which yields an initial plasma density of approx, 1 x 10(15) cm(-3) and x/sub s/ approx. 0.40. FRCs translate from the approx. 25 cm radius source coil into a 20 cm radius metal translation vessel. Of many translation conditions studied, the condition considered here is translation into a weak quide field resulting in expansion of the FRC to conditions of density approx. 3 x 10(14) and x-sub s/ approx. 0.7. The expected reversed B/sub z/ structure is observed. Evidence of island structure is also observed. Fluctuating levels of B-sub THETA/ are observed with amplitudes less than or equal to B0/3 and values of flux approx. 4 x the poloidal flux. DOE

N85-26395# Oak Ridge National Lab., Tenn.
MHD FLUCTUATIONS IN ISX-B
J. D. Bell, J. L. Dunlap, V. K. Pare, and A. J. Wootton 1984 35 p refs Presented at the Meeting of the Plasma Phys. Div. of the Am. Physical Soc., Boston, 27 Oct. 1984
(Contract DE-AC05-84OR-21400)
(DE85-004800; CONF-841010-14) Avail: NTIS HC A03/MF A01

Studies of beam-heated plasmas with Mirnov coils continue. Previous observations have shown no correlation between the (1;1) driven modes and confinement; however, at higher frequencies, such as correlation can be found. A band-pass filter, monitoring frequencies approximately 150 kHz, and the integrated fluctuation amplitude from the high-frequency waveform data are used to obtain bar B(theta)/B(theta). The results show increasing bar B(theta)/B(theta) is associated with decreasing energy confinement for I(p) and P(b) scans and for cases with and without added neon (known to modify confinement). Using three coils at different toroidal locations, modes with a n approximately 15 were found under certain conditions. A comparison of co-, counter-, and balanced beam discharges, in which toroidal rotation velocities were measured, allows an estimate of the n values monitored during the scans. DOE

N85-26396# Argonne National Lab., Ill.
NEW DIRECTIONS IN TOKAMAK REACTORS
C. C. Baker 1985 2 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract W-31-109-eng-38)
(DE85-002548; CONF-850310-5) Avail: NTIS HC A02/MF A01

Directions for Tokamak research are identified. Some areas for considerations are: reactor size, beta ratio, current drivers, blankets, impurity control, and modular designs. DOE

N85-26397# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
METHODS OF FIRST WALL STRUCTURAL ANALYSIS WITH APPLICATIONS TO THE LONG PULSE COMMERCIAL TOKAMAK REACTOR DESIGN M.S. Thesis
R. J. Leclaire, Jr. May 1984 153 p refs
(Contract DE-AC02-78ET-51013)
(DE85-004915; PFC/RR-84-9; DOE/ET-51013/123) Avail: NTIS HC A08/MF A01

Methods of analysis for fusion first wall design are developed. Several design limits were evaluated and combined to present trade-offs in the form of design windows. These considerations include limits related to thermal fatigue, primary membrane strength, displacement under loading, ratcheting, radiation damage, and plasma-wall interactions. Special emphasis is placed on investigation of thermal fatigue using a two dimensional treatment of a tubular first wall configuration. The impact of pertinent characteristics such as pulse length, coolant pressure, first wall thickness and first wall lifetime are of interest. Computer programs are developed and consider several major structural effects on a cylindrical first wall element for both 316 stainless steel and vanadium alloy. DOE

N85-26398# Argonne National Lab., Ill.
PERFORMANCE OF A COPPER-LITHIUM ALLOY AS AN IMPURITY CONTROL SYSTEM SURFACE MATERIAL FOR A FUSION REACTOR
J. N. Brooks, A. R. Krauss, R. F. Mattas, and A. B. DeWald Oct. 1984 22 p refs
(Contract W-31-109-eng-38)
(DE85-006494; ANL/FPP/TM-194) Avail: NTIS HC A02/MF A01

A copper-lithium alloy was evaluated as a surface material for the impurity control system of the INTOR reactor. Both the medium edge temperature limiter regime and the low edge temperature divertor regime were examined. The analysis used TRIM code data to predict sputtering coefficients for copper-lithium with a 1.5 monolayer coverage of lithium. The REDEP code was used to evaluate the erosion performance for INTOR. Other properties such as fabrication and thermal performance were also briefly assessed. It was found, from the standpoint of erosion, that copper-lithium is a very good candidate material for the medium edge temperature regime, and also works well in the low edge temperature regime. For the medium edge temperature regime, the use of copper-lithium results in an almost negligible erosion rate over the entire limiter surface. DOE

N85-26399# California Univ., Livermore. Lawrence Livermore Lab.
PLASMA-WALL INTERACTIONS IN TANDEM MIRROR MACHINES
S. L. Allen Nov. 1984 34 p refs Presented at NATO Advanced Study Inst. on Phys. of Plasma-Wall Interactions in Controlled Fusion, Quebec, 6 Aug. 1984
(Contract W-7405-eng-48)

(DE85-006387; UCRL-91287; CONF-8408144-1) Avail: NTIS HC A03/MF A01

The plasma-surface interactions in thermal-barrier tandem-mirror machines are discribed. The thermal-barrier mode of axial confinement is an integral part of a tandem mirror, and it dictates the required plasma conditions, particularly at the surface of the plasma. For this reason, a qualitative discussion of the thermal barrier is presented. The experimental configuration used in tandem mirrors to create the thermal barrier is then examined in detail. The TMX-U and MFTF-B machines are used as specific examples. The relevant plasma-surface interaction issues are addressed, and experimental results from currently operating tandom mirror machines are included. Future work concerned with plasma-surface interactions in tandem mirrors is discussed. DOE

N85-26400# California Univ., Berkeley. Lawrence Berkeley Lab.
DEVELOPMENT OF RF PLASMA GENERATORS FOR NEUTRAL BEAMS
M. C. Vella, R. W. Ehlers, D. Kippenhan, P. A. Pincosy, R. V. Pyle, W. F. DiVergilio, and V. V. Fosnight Oct. 1984 20 p refs Presented at 31th Natl. Vacuum Symp., Reno, Nev., 3 Dec. 1984
(Contract DE-AC03-76SF-00098)
(DE85-004125; LBL-18015; CONF-841218-17) Avail: NTIS HC A02/MF A01

The development of low frequency (1 to 2 MHz) RF plasma generators for high power neutral beam applications is summarized. Immersed couplers from one to three turns were used. Acceptable plasma profiles, less than or equal to 15% max/min, were obtained in a variety of field-free magnetic bucket and magnetic filter-bucket sources, with 10 x 10 cm or 10 x 40 cm extraction areas. Hydrogen beam properties were measured with a 7 x 10 cm accelerator operated at 80 kV. Atomic fraction and power efficiency were at least as high as with arc plasmas in similar chambers. The potential advantages of an RF plasma source are: ease of operation; reliability; and extended service lifetime. DOE

N85-26401# Argonne National Lab., Ill.
TOROIDAL EQUILIBRIUM WITH LOW FREQUENCY WAVE DRIVEN CURRENTS
D. A. Ehst Dec. 1984 19 p refs
(Contract W-31-109-eng-38)
(DE85-005790; ANL/FPP/TM-195) Avail: NTIS HC A02/MF A01

In the absence of an emf the parallel current, j/sub parallel/, in a steady state Tokamak will consist of a neoclassical protion plus a wave-driven contribution. Using the drift kinetic equation, the quasilinear (wave-driven) current is computed for high phase speed waves in a torus, and this is combined with the neoclassical term to obtain the general expression for the flux surface average <j/sub parallel/B>. For a given pressure profile this technique fully determines the MHD equilibrium, permitting the study of a new class of toroidal equilibria. DOE

N85-26402# JAYCOR, San Diego, Calif.
THEORETICAL STUDIES OF ELMO BUMPY TORUS Annual Report
31 Dec. 1984 73 p refs
(Contract DE-AC01-82ER-53126)
(DE85-007202; DOE/ER-53126/T2) Avail: NTIS HC A04/MF A01

Investigations of the effect of waves on stability and transport considered the possibility of using radio frequency waves to stabilize interchange modes, as well as the general problem of influencing plasma transport by wave absorption; Studies wave heating of plasmas considered nonlinear effects such as mode conversion and parametric absorption, along with studies of the structure of ion cyclotron waves in a strongly bumpy geometry. Ring physics studies added nonadiabaticity and whistler instabilities to the model, producing a fairly realistic picture of energy balance, power requirements, and scaling for hot electron rings. Studies analyzing EBT transport data were performed, with emphasis on testing various hypotheses for apparent anomalies in the EBY. DOE

N85-26403# Argonne National Lab., Ill.
SELF-SUSTAINING LOW-Z COATINGS FOR FUSION APPLICATIONS 2 - COPPER-LITHIUM
A. R. Krauss, D. M. Gruen, J. N. Brooks, and A. B. DeWald (Georgia Inst. of Technol.) 3 Mar. 1985 4 p Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract W-31-109-eng-38)
(DE85-002553; CONF-850310-6) Avail: NTIS HC A02/MF A01

Dilute alloys of lithium in copper have been examined both experimentally and by computer modelling methods as a means of demonstrating the principle of self-sustaining coatings for fusion applications. Issues addressed concern the formation of a low-Z coating by solute segregation in a binary alloy, maintenance of the coating in a sputtering environment, partial sputtering yields of the alloy components, and a comparison of the calculated net erosion for W, Mo and Cu-Li when used as either the divertor plate or the bottom limiter of INTOR. DOE

N85-26404# California Univ., Livermore. Lawrence Livermore Lab.
FINITE ORBIT ANALYSIS FOR LONG WAVELENGTH MODES IN A PLASMA WITH A HOT COMPONENT
J. H. Hammer and H. I. Berk (Texas Univ., Austin) Jan. 1985 33 p refs
(Contract DE-FG05-80ET-53088)
(DE85-006896; DOE/ET-53088/167; IFSR-167) Avail: NTIS HC A03/MF A01

The z-pinch model is used to calculate finite Larmor radius effects of a plsma with a hot component plasma annulus. The equations are analyzed for layer modes and the finite Larmor radius stabilization condition is calculated. Stability requires k(2)rho/sub h/(2)R(BETA)/sub h//(DELTA) greater than or equal to 1, where k is the wavenumber in the z-direction, rho/sub h/ the hot species Larmor radius, (BETA)/sub h/ the hot particle beta and (DELTA) the thickness of the pressue profile. In addition a new instability is found due to the interaction of the precessional modes associated with inner and outer edges of the hot particle pressure profile. DOE

N85-26405# Illinois Univ., Urbana.
OPTIMAL CONTROL THEORY APPLIED TO FUSION PLASMA THERMAL STABILIZATION
G. Sager, G. Miley, and I. Maya (GA Technologies, Inc.) 1985 2 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract DE-AC02-76ET-52040)
(DE85-007599; CONF-850310-13; COO-2218-311) Avail: NTIS HC A02/MF A01

Stability characteristics and performance of various burn control schemes were investigated. The first application of optimal control theory to the problem of fusion plasma thermal stabilization is presented. The objectives were to develop analysis methods, demonstrate tractability, and present some preliminary results of optimal control theory in burn control research. DOE

N85-26314# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF THEORY OF HIGH-CURRENT HIGH-PRESSURE PULSED ARC Abstract Only
V. V. Korneyev, A. N. Lobanov, and K. N. Ulyanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 57 Transl. into ENGLISH from Elektrichestvo (Moscow), no. 9, Sep. 1984 p 25-29 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N85-26406*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OPTICAL PROPERTIES OF HYDROGENATED AMORPHOUS CARBON FILMS GROWN FROM METHANE PLASMA

J. J. Pouch, S. A. Alterovitz, J. D. Warner, D. C. Liu, and W. A. Lanford (State Univ. of New York, Albany) 18 Apr. 1985 8 p refs Presented at Spring Meeting of the Mater. Res. Soc., San Francisco, 15-18 Apr. 1985

(NASA-TM-86995; E-2541; NAS 1.15:86995) Avail: NTIS HC A02/MF A01 CSCL 20L

A 30 kHz ac glow discharge formed from methane gas was used to grow carbon films on InP substrates. Both the growth rate, and the realitive Ar ion sputtering rate at 3 keV varied monotonically with deposition power. Results from the N-15 nuclear reaction profile experiments indicated a slight drop in the hydrogen concentration as more energy was dissipated in the ac discharge. Values for the index of refraction and extinction coefficient ranged from 1.721 to 1.910 and 0 to -0.188, respectively. Optical bandgaps as high as 2.34 eV were determined. Author

N85-26407*# New South Wales Univ., Kensington (Australia). School of Electrical Engineering.

STUDIES IN ELECTRON PHENOMENA IN MOS STRUCTURES: THE PULSED C-V METHOD M.S. Thesis. Abstract Only

G. Kaplan 1983 2 p

Avail: NTIS HC A02/MF A01

The pulse hysteresis capacitance voltage (C-V) provides a straight forward technique for measuring the change of various charges in MOS structures and a tool for investigating the kinetics of various electron phenomena is developed and described. The method can be used for measuring the energy distribution and kinetics of surface states with the resolution of about 1/5 x 10 to the -9 power cm eV. Some transients in an MOS structure, particularly, the thermal generation of minority charge carriers via surface states and the relaxation of minority charge carriers supplied from the inversion layer outside the MOS structure are theoretically investigated. Analytical expressions which clearly present the physics of those electron phenomena are derived. A.R.H.

N85-26408# Case Western Reserve Univ., Cleveland, Ohio. Lab. for Polymer Microdevices.

APPLICATIONS OF PIEZOELECTRIC AND PYROELECTRIC THIN FILMS: OPPORTUNITIES FOR LANGMUIR-BLODGETT TECHNOLOGY

M. B. Biddle and S. E. Rickert 31 Dec. 1984 49 p refs

(Contract N00014-83-K-0246; NR Proj. 631-841)

(AD-A149239; TR-09) Avail: NTIS HC A03/MF A01 CSCL 20/3

Oriented films possessing dipole moments have seen increasing use of their piezoelectric and pyroelectric properties in pressure, acoustic, thermal, and optical devices. The performance of these devices in many applications is enhanced by thin film technology. The current thin film technology and possible opportunities for the developing Langmuir-Blodgett thin film deposition technique is reviewed with an emphasis on applications. Author

N85-26409# Massachusetts Inst. of Tech., Cambridge. National Magnet Lab.

SYNTHESIS AND CHARACTERIZATION OF SUPERCONDUCTING ELECTRONIC MATERIALS Final Technical Report, 1 Jul. 1982 - 30 Sep. 1984

R. H. Meservey, P. M. Tedrow, and T. P. Orlando 15 Nov. 1984 17 p

(Contract F49620-82-K-0028)

(AD-A151112; AFOSR-85-0117TR) Avail: NTIS HC A02/MF A01 CSCL 20/3

Specialized vacuum deposition systems were developed with the necessary monitoring and control to synthesize or react refractory superconducting films. NbN, VN, NbTi, and VTi films of high quality have been produced and their transport and tunneling properties studied. Ultra-thin films of pure Nb have been successfully made to study spin-orbit scattering in transition metals. The structural properties and penetration depth of NbN films prepared by reactive sputtering have been studied. Many-body effects which are important in superconductivity have been observed by spin-polarized tunneling and the antisymmetric Fermi liquid parameter has been measured for the first time in Al. The technique of deconvoluting tunneling conductance curves to obtain the superconducting density of states has been improved. A comprehensive study was made of amorphous Ge tunnel barriers between superconductors. GRA

N85-26410# Cornell Univ., Ithaca, N.Y. Lab. of Atomic and Solid State Physics.

PRESSURE-DEPENDENCE OF TiS(2) AND TiSe(2) BANDSTRUCTURES Interim Technical Report

G. A. Benesh, A. M. Woolley, and C. Umrigar 22 Feb. 1985 23 p

(Contract N00014-82-K-0576)

(AD-A151200; TR-12) Avail: NTIS HC A02/MF A01 CSCL 20/12

The bandstructures of the layer compounds IT-TiS2 and IT-TiSe2 have been calculated within the local density approximation using the self-consistent LAPW method. Both compounds are found to be semimetals with r -L overlaps of 0.24 and 0.55 eV, respectively. The positioning and occupation of the bands near the Fermi level are not consistent with the carrier densities determined from Hall measurements; however, agreement is obtained when the overlap is decreased by about 0.25 eV. Calculations performed with contracted lattice constants reproduce qualitatively the same trends in Hall coefficients as observed experimentally. However, quantitative agreement can not be obtained without an overlap decrease of about 0.25 eV - indicating that TiSe2 is a semimetal and TiS2 a semiconductor. GRA

N85-26411# Arizona Univ., Tucson. Optical Sciences Center.

IN SITU THIN FILM MEASUREMENT Final Report

H. A. Macleod Dec. 1984 46 p

(Grant AF-AFOSR-0353-83)

(AD-A151365; AFOSR-85-0081TR) Avail: NTIS HC A03/MF A01 CSCL 13/8

A scanning monochromator system for the monitoring of thin film deposition in a box coater is described. The system employs data from both a quartz crystal oscillator and a wide band transmission spectrometer. The spectrometer uses a holographic grating as its dispersive element and a CCD array to collect the data. All data is sent to a microcomputer where the information is displayed, stored, and analyzed. Several applications, including measurement of optical constants of optical constants of inhomogeneous films and characterization of moisture adsorption, are discussed. GRA

N85-26412# Kansas State Univ., Manhattan. Dept. of Physics.

RAMAN STUDIES OF SURFACE TEMPERATURE IN LASER-HEATED SEMICONDUCTORS Final Report, 1 Apr. 1980 - 30 Sep. 1984

A. D. Compaan 7 Feb. 1985 10 p

(Contract N00014-80-C-0419)

(AD-A151377) Avail: NTIS HC A02/MF A01 CSCL 09/1

This project explored the uses of pulsed laser Raman scattering as a technique for studying vibrational or phonon temperatures in Si with nanosecond time resolution. Raman scattering is unique in its ability to probe in a highly selective way populations of specific phonon modes. Knowledge of how phonon populations evolve in time of fundamental importance in understanding how semiconductors respond to intense laser pulses such as in pulsed laser annealing of semiconductor surfaces. This information is crucial for understanding the dynamics of rapid laser-induced melting. Raman scattering was performed with a heat/probe sequence derived from a frequency doubled Nd:YAG-laser-pumped or N2-laser-pumped dye lasers. Initial results showed low phonon populations, consistent with only a 300-400 K temperature rise after a 10 nsec heat pulse with energy sufficient to melt the Si surface. Final results, however, indicate a population rise equivalent

to a 1500 + or - 300 K phonon temperature. This is consistent with normal 1685 K melting temperature of Si. These results were confirmed in second order Raman scattering with 150 nsec pulses from a 10 kHz frequency-doubled Nd:YAG laser. Thus we measure melting-temperature phonon populations in several phonon branches. Additional experiments were done to measure the optical absorption in transiently heated silicon-on-sapphire. We found absorption consistent with that of molten Si from 0.8 eV to 3.1 eV. GRA

N85-26413# Brandeis Univ., Waltham, Mass.
INTERACTION OF LIQUID CRYSTALS WITH INHOMOGENEOUS SURFACES Final Report, 20 Jul. 1980 - 19 Jan. 1984
R. B. Meyer Jan. 1985 9 p
(Contract DAAG29-80-K-0050)
(AD-A151557; ARO-16769.1-PH) Avail: NTIS HC A02/MF A01 CSCL 20/2

We undertook the study of the interaction of nematic liquid crystals with inhomogeneous solid surfaces, in the attempt to better understand surface interactions and to fabricate new kinds of devices with novel surface alignment techniques. Along with the surface studies, we considered the optic properties of the new liquid crystal configurations we were attempting to fabricate, and new electro-optical effects that might be achieved. The new surface treatments that we investigated were ones consisting of a microscopically inhomogeneous array of different aligning agents. The cases studied in detail were that of a surface which aligns the nematic director perpendicular to itself, on which we created a random array of spots, a few hundred angstroms in diameter, in which the director is parallel to the surface, and the inverse, i.e., spots of vertical alignment on a horizontal aligning surface. GRA

N85-26414# Oakland Univ., Rochester, Mich. Dept. of Physics.
NEUTRALIZATION AND EXCITATION IN LOW-ENERGY ION-SURFACE COLLISIONS Interim Report
H. W. Lee and T. F. George (Rochester Univ.) Feb. 1985 41 p Submitted for publication
(Contract N00014-80-C-0472)
(AD-A151568; AD-E500700; UROCHESTER/DC/85/TR-58) Avail: NTIS HC A03/MF A01 CSCL 20/8

A model is presented which describes neutralization and excitation occurring in low-energy ion-surface collisions. Important processes that determine experimentally measurable quantities such as the charged fraction f+ and photon yield gamma are assumed to be Auger neutralization, electronic excitation and radiationless deexcitation. The model yields f+ and gamma in good agreement with experimental data, although log f+ and log gamma are found to exhibit nonlinear dependences on the inverse velocity of the incident ion beam. GRA

N85-26415# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
FABRICATION AND I-V CHARACTERIZATION OF AlGaAs/GaAs MODFETS WITH P-TYPE SURFACE LAYERS GROWN BY MOLECULAR BEAM EPITAXY M.S. Thesis
K. Szabo Dec. 1984 116 p
(AD-A151695; AFIT/GE/ENG/84D-65) Avail: NTIS HC A06/MF A01 CSCL 20/12

The effects of highly doped p+ surface layers on the Schottky barrier of n-type AlGaAs/GaAs MODFETs (Modulation doped FET's) were investigated for this thesis. Normal AlGaAs/GaAs MODFET structures were first grown on top of semi-insulating GaAs structures using molecular beam epitaxy (MBE) and then thin p+ (50 A) surface layers were grown on top of the MODFET structures. Two different sequential evaporations (Au/Ni/Au/Ge/Ni, Au/Ni/Au/Ge) were used for the source/drain contacts. The results show that these two sequential evaporations do not work on MODFETs with p+ surface layers. High resistance, rectifying source/drain contacts resulted. GRA

N85-26416# North Carolina State Univ., Raleigh. Dept. of Materials Engineering.
FUNDAMENTAL STUDIES OF GROWTH, DOPING AND TRANSFORMATION IN BETA SILICON CARBIDE Final Technical Report, 1 Feb. 1982 - 31 Jan. 1985
R. F. Davis and H. H. Stadelmaier 20 Feb. 1985 159 p
(Contract N00014-84-K-0182; RR0-2102)
(AD-A152047; NCSU-243-043-006) Avail: NTIS HC A08/MF A01 CSCL 20/12

During this three-year granting period, the growth and characterization of high purity and high quality Beta-SiC thin films has reached a highly sophisticated level. This report details the CVD growth and in situ doping and the thermodynamic considerations thereof as well as ion implantation; SIMS, TEM, Auger, Raman and electrical characterization; ohmic contact studies; oxidation experiments and the fabrication of Schottky barrier diodes and p-n junctions. GRA

N85-26417# Brookhaven National Lab., Upton, N. Y. Metallurgy and Materials Science Div.
APPROXIMATE CLOSED-FORM EXPRESSION FOR THE ELECTRON-SCATTERING-INDUCED INTERACTION BETWEEN MAGNETIC FLUX LINES AND GRAIN BOUNDARIES
David O. Welch 10 Sep. 1984 4 p refs Presented at the Applied Superconductivity Conf., San Diego, Calif., 9 Sep. 1984
(Contract DE-AC02-76CH-00016)
(DE85-004699; BNL-35375; CONF-840937-26) Avail: NTIS HC A02/MF A01

An approximate closed-form result for the interaction of an isolated magnetic flux line in a Type-II superconductor with a grain boundary, due to the scattering of electrons by the boundary, is presented. The grain boundary need not be infinitely thin, but can include a distribution of scattering centers nearby. The resulting expressions are more suitable for computer simulations of flux pinning and their interpretation is more physically transparent than previous results; they are used here to discuss pinning by nonideal boundaries. DOE

N85-26418# Oak Ridge National Lab., Tenn.
CONVOY ELECTRON PRODUCTION BY HEAVY IONS IN SOLIDS
Ivan A. Sellin (Tennessee Univ., Knoxville) 1984 18 p refs Presented at the 8th Conf. on the Application of Accelerators in Res. and Ind., Denton, Tex., 12 Nov. 1984 Sponsored in part by NSF
(Contract DE-AC05-84OR-21400)
(DE85-005256; CONF-841117-38) Avail: NTIS HC A02/MF A01

The term convoy electron refers to those electrons ejected in fast ion-atom and ion-solid collisions closely matched in vector velocity to that of the incident heavy particles responsible for their ejection. Similarities and differences among electrons ejected into such states through binary electron capture to continuum and electron loss to continuum processes in single ion-atom encounters are compared and contrasted to more complex ejection processes occurring in solid targets. Puzzles posed by the apparent strong projectile Z dependence but weak emergent ion charge dependence of the yield in the case of solid targets are reviewed. Very recent progress in resolving these puzzles has been made by recent observations that the apparent mean free path for electron scattering out of the forward direction within the target is observed to be an order of magnitude greater than that for free electrons of equal velocity provided the projectile charge is high. DOE

N85-26419# Xerox Corp., Palo Alto, Calif.
THE STRUCTURAL AND ELECTRONIC PROPERTIES OF AMORPHOUS SILICON BASED ALLOY MATERIALS Final Report, Jun. 1983 - May 1984
D. K. Biegelsen, W. B. Jackson, J. B. Boyce, N. M. Johnson, R. J. Nemanich, R. A. Street, M. Stutzmann, M. J. Thompson, R. Thompson, C. C. Tsai et al Oct. 1984 43 p refs
(Contract DE-AC02-83CH-10093)
(DE85-002909; SERI/STR-211-2557) Avail: NTIS HC A03/MF A01

The structure and electronic properties of hydrogenated amorphous silicon and its alloys are described, emphasizing localized states in the gap and interface states. The FSR and

photoconductivity studies of prolonged illumination have led to a new model for the Staebler-Wronski effect, in which extra dangling bonds are created as a consequence of recombination. There is new evidence that the effect does not require the presence of impurities. DDTS and optical studies of gap states confirm that the dangling bond states are near mid-gap. Detailed information is presented concerning their role as recombination centers, through luminescence, ESR, and photoconductivity experiments. New localized states associated with phosphorus impurities were observed by ESR, although their structural identity is not yet known. Time-of-flight measurements of compensated a-Si:H show that although the dangling bond density is low, compensation introduces other states near the band edges that could be boron-phosphorus complexes. Inverse photoemission has measured the conduction band density of states, identifying Si-H artibonding states and the approximate location of the mobility edge. DOE

N85-26420# National Bureau of Standards, Boulder, Colo.
DIAGNOSTICS OF A GLOW DISCHARGE USED TO PRODUCE HYDROGENATED AMORPHOUS SILICON FILMS Final Report
A. Gallagher Nov. 1984 40 p
(Contract DE-AC02-83CH-10093)
(DE85-002914; SERI/STR-211-2408) Avail: NTIS HC A03/MF A01

Measurements of the neutral radicals produced in pure silane discharges are summarized. Measurements of the interaction of silane with a growing amorphous silicon surface, qualitative models of discharge neutral radical chemistry, and quantitative models of dc discharge ion chemistry are presented. All radicals of the monosilane and disilane groups were measured and are reported as a function of discharge parameters, but not yet for the full range of parameters that must be investigated for detailed analysis. Observations of the reaction of SiH4 with à hot amorphous silicon surface are given. These are closely related to the dominant discharge film deposition mechanism of SiH3 reacting with a hydrogen covered amorphous silicon surface and a surface reaction model is suggested that explains some but not all of the data. The dc discharge model is used to obtain quantitative predictions of the ion species at the cathode surface of a dc discharge. This is compared to observatins and used to explain the observations. Most but not all features of the ion chemistry in dc discharges of pure silane can be relatively well understood from this model. DOE

N85-26421# Delaware Univ., Newark. Inst. of Energy Conversion.
CHEMICAL VAPOR DEPOSITION OF AMORPHOUS SEMICONDUCTOR FILMS Final Subcontract Report
R. E. Rocheleau Dec. 1984 114 p refs
(Contract DE-AC02-83CH-10093)
(DE85-002917; SERI/STR-211-2522) Avail: NTIS HC A06/MF A01

Chemical vapor deposition (CVD) from higher order silanes has been studied for fabricating amorphous hydrogenated silicon thin-film solar cells. Intrinsic and doped a-Si:H films were deposited in a reduced-pressure, tubular-flow reactor, using disilane feed-gas. Conditions for depositing intrinsic films at growth rates up to 10 A/s were identified. Electrical and optical properties, including dark conductivity, photoconductivity, activation energy, optical absorption, band-gap and sub-band-gap absorption properties of CVD intrinsic material were characterized. Parameter space for depositing intrinsic and doped films, suitable for device analysis, was identified. DOE

N85-26422# Stanford Linear Accelerator Center, Calif.
TEST OF THE ELECTRONIC STRUCTURE OF Fe(100) BY ABSORBED CURRENT SPECTROSCOPY
E. Kisker, R. P. Kirby, B. L. Garwin, F. K. King, E. Tamura, and R. Feder Oct. 1984 5 p refs Presented at the 30th Ann. Conf. on Magnetism and Magnetic Mater., San Diego, Calif., 27-30 Nov. 1984 Prepared in cooperation with Kerforschungsanlage Juelich G.m.b.H., (West Germany)
(Contract DE-AC03-76SF-00515)
(DE85-004942; SU-SLAC-PUB-3499; CONF-841184-32) Avail: NTIS HC A02/MF A01

The absorbed electron current for a clean Fe(100) surface as a function of energy rises step-like at the vacuum-energy cutoff with an absorption close to 1. The smooth decrease of absorbed current at higher electron energy due to secondary electron emission is superimposed by a considerablel amount of fine structure, the amplitude of which decreases with increasing energy. These features are found in good agreement with the results of a calculation of the elastic part of the electron reflection coefficient. Further, they are compared with the ferromagnetic electronic bulk bandstructure calculated above the vacuum energy. From the comparison with the experimental data, the energy dependence of the real and imaginary parts of the inner potential is determined. DOE

N85-26423# Schott Optical Glass, Inc., Duryea, Pa.
IMPURITY STUDIES Final Status Report
David Krashkevich and D. Perle Dec. 1984 65 p
(Contract W-7405-eng-48)
(DE85-006235; UCRL-15651; FSR-6) Avail: NTIS HC A04/MF A01

The data presented comprises measurement results of the UP-91 water content study, conducted at 0.50, 5.00, 10.00 and 20.00 wt. % Nd input doping levels, as well as the IG-660, UP-16 and UP-91 ultrapure melts which were generated using fiber optic grade materials. Experimental results for these melts appear in tables. Plots of the first e-folding time, 1n first e-folding time and decay rate as a function of impurity input for the UP-91 water content study appear in graphs. Due to the low transmission encountered in 20 wt % doped UP-91 glass, the index of refraction for the IS-35 series had to be measured using the yellow sodium line, n/sub D/, centered at 589.29 nm. A similar correlation between n/sub d/ and n/sub D/ as seen in the UP-16 series can be inferred. A summation of the slope and intercept data along with graphed data location for the UP-91 water content series appear in tables. Results of the ultrapure melts are compared with corresponding in-house material melts. DOE

N85-26424# Stanford Linear Accelerator Center, Calif.
SUPERCONDUCTING TRAVELING WAVE ACCELERATORS
Z. D. Farkas Nov. 1984 18 p refs
(Contract DE-AC03-75SF-00515)
(DE85-006247; SU-SLAC/AP-38) Avail: NTIS HC A02/MF A01

The applicability of superconductivity to traveling wave accelerators is considered. Unlike CW operation of a superconducting standing wave or circulating wave accelerator section, which requires improvement factors (superconductor conductivity divided by copper conductivity) of about 10(6) in order to be of practical use, a Superconducting Traveling wave factors as low as about 10(3), which are attainable with niobium or lead at 4.2K, the temperature of liquid helium at atmospheric pressure. Changing from a copper traveling wave accelerator to SUTRA achieves the following: (1) for a given gradient SUTRA reduces the peak and average power requirements typically byu a factor of 2; (2) SUTRA reduces the peak power still further because it enables us to increase the filling time and thus trade pulse width for gradient; (3) SUTRA makes possible a reasonably long section at higher frequencies; and (4) SUTRA makes possible recirculation without additional RF average power. DOE

N85-26425# Michigan Univ., Ann Arbor. Dept. of Physics.
ELECTRONIC TRANSPORT IN Mo/Ni SUPERLATTICE
R. Clarke, D. Morelli, C. Uher, Hitoshi Homma (Argonne National Lab., Ill.), and I. K. Schuller (Argonne National Lab., Ill.) Nov. 1984 11 p refs Presented at the Intern. Conf. on Superlattices, Microstruct. and Microdevices, Champaign-Urbana, Ill., 13 Aug. 1984
(Contract W-31-109-eng-38)
(DE85-006835; CONF-840877-4) Avail: NTIS HC A02/MF A01

An experimental relationship between superconductivity, magnetism and localization is explored in short-wavelength (14A

less than or equal to (LAMBDA) less than or equal to 40A) sputtered Mo/Ni superlattices. A crossover to a superconducting state is observed for (LAMBDA) < 9A consistent with the observed paramagnetic behavior when the Ni strata are four atomic layers thick or less. All samples show localization effects at helium temperatures and nonsuperconducting samples develop an unusual resistance plateau below T approx. = 0.5K. DOE

N85-26426# California Univ., Livermore. Lawrence Livermore Lab.
MOLECULAR DYNAMICS STUDIES OF ENERGY TRANSFER PROCESSES IN CRYSTAL SYSTEMS Annual Summary Report
A. M. Karo and F. E. Walker Jan. 1985 8 p
(Contract W-7405-eng-48)
(DE85-007247; UCID-20327) Avail: NTIS HC A02/MF A01

Molecular dynamics involves the numerical solution by computer of Newton's equations of motion for all the atoms comprising the active region of the assembly. As a result the coordinates and velocities of the particles are obtained as functions of time. Shock-induced fast-decomposition processes are one of a wide variety of phenomena brought about by shock passage through condensed matter. Computer programs developed to treat molecular lattices and molecular species within these lattices are reviewed. Shock studies were carried out on ice treated as a simple two-dimensional molecular structure. DOE

N85-26427# Brookhaven National Lab., Upton, N. Y.
LATTICE OVERVIEW
M. Creutz 1984 6 p refs Presented at the American Physical Society Meeting, Santa Fe, N. Mex., 31 Oct. 1984
(Contract DE-AC02-76CH-00016)
(DE85-007282; BNL-35800; CONF-8410222-10) Avail: NTIS HC A02/MF A01

After a review of some recent developments in supercomputer access, a few areas where perturbation theory and lattice gauge simulations make contact are presented. A brief discussion of a deterministic dynamics for the Ising model is presented. This may be useful for numerical studies of nonequilibrium phenomena. DOE

N85-26428# Pacific Northwest Lab., Richland, Wash.
GRAIN BOUNDARY COMPOSITION AND INTERGRANULAR FRACTURE OF STEELS. VOLUME 1: DETECTION OF GRAIN BOUNDARY SEGREGATION IN STEELS Final Report
S. M. Bruemmer, L. A. Charlot, M. T. Thomas, and R. H. Jones Jan. 1985 88 p refs Sponsored in part by EPRI
(EPRI Proj. 2257-1)
(DE85-006850; EPRI-RD-3859-Vol-1) Avail: NTIS HC A05/MF A01

Several alternative techniques for the measurement of grain boundary composition in iron-base alloys were evaluated, including Secondary Ion Mass Spectroscopy (SIMS), Analytical Electron Microscopy (AEM), and chemical/electrochemical etching. Potential problems in grain boundary composition measurements of CrMoV and NiCrMoV steels by AES were identified as a result of AES, high-resolution AES, and AEM characterization. Significant differences were identified in comparing peak height ratios on identical specimens using PHI 545, 560, and 595 systems. These differences were due to instrument parameters that are generally not known for any particular AES system. Localized ductile tearing regions and the presence of second phase particles on intergranular faces exposed by fracture led to significant point to point composition varitions. Phosphorus levels varied by more than 50% across individual grain boundary facets. Copper-tin intermetallics were observed by AEM in the CrMoV steel and nickel-tin intermetallics in the NiCrMoV steel. Much of the tin documented by AES at grain boundaries could be explained by the presence of these small intermetallic precipitates. DOE

N85-26429# Brookhaven National Lab., Upton, N. Y.
CHARACTERIZATION OF THIN FILMS AND LAYERED STRUCTURES USING X-RAY ABSORPTION AND REFLECTION AT GRAZING INCIDENCE
S. M. Heald, J. M. Tranquada, D. O. Welch, and H. Chen 1984 6 p refs Presented at the Materials Research Society Ann. Meeting, Boston, 26 Nov. 1984
(Contract DE-AC02-76CH-00016)
(DE85-006560; BNL-35654; CONF-841157-67) Avail: NTIS HC A02/MF A01

X-rays at grazing incidence have a short, controllable penetration depth and are well suited as a probe of surface and interface structures. This paper examines the possibility applying grazing-incidence reflectivity and Extended X-Ray Absorption Fine Structure (EXAFS) measurements to such systems. Results are presented for an Al-Cu couple for which both high resolution reflectivity and interface EXAFS measurements are made. The latter results are the first interface specific EXAFS data to be reported. Distinct changes in both signals are observed upon annealing, demonstrating the potential of the techniques. DOE

N85-26430# California Univ., Berkeley. Lawrence Berkeley Lab.
ASSESSMENT OF PRESENT AND FUTURE LARGE-SCALE SEMICONDUCTOR DETECTOR SYSTEMS
H. G. Spieler and E. E. Haller Nov. 1984 10 p refs Presented at the Nucl. Sci. Symp., Orlando, Fla., 31 Oct. 1984
(Contract DE-AC03-76SF-00098)
(DE85-006606; LBL-18684; CONF-841007-57) Avail: NTIS HC A02/MF A01

The performance of large-scale semiconductor detector systems was assessed for their theoretical potential and to the practical limitations imposed by processing techniques, readout electronics and radiation damage. Devices which detect reaction products directly and photodetectors for scintillator are analyzed. Currently evolving structures and techniques which show potential for producing practical devices in the foreseeable future are examined. E.A.K.

N85-26431# Fermi National Accelerator Lab., Batavia, Ill.
ELEVEN LECTURES ON THE PHYSICS OF THE QUARK-GLUON PLASMA
I. McLerran Oct. 1984 135 p refs Presented at the Workshop on the Phys. of the Quark-Gluon Plasma, Wuhan, China, 1 Sep. 1983
(Contract DE-AC02-87CH-03000)
(DE85-004321; FNAL/C-84/101-T; CONF-8309307-Exec) Avail: NTIS HC A07/MF A01

The lectures presented are intended to be an introduction to the physics of the quark-gluon plasma. The lectures cover perturbation theory of the plasma at high temperature as well as the non-perturbative methods and results of lattice gauge theory computations. Physical models of the confinement-deconfinement phase transition and the modes of chiral symmetry breaking are presented. The possibility that a quark-gluon plasma might be produced in ultra-relativistic nuclear collisions is analyzed. Separate entries were prepared for the data base for the elever lectures. DOE

N85-26432# Utah Univ., Salt Lake City. Dept. of Materials Science and Engineering.
EXPERIMENTAL STUDIES OF THE ELECTRONIC STRUCTURE OF 1-2 AND 1-3 INTERMETALLIC COMPOUNDS Progress Report, 15 Jun. 1984 - 14 Feb. 1985
I. M. Curelaru 1985 58 p refs
(Contract DE-FG02-84ER-45143)
(DE85-006978; DOE/ER-45143/T1) Avail: NTIS HC A04/MF A01

EEL/AES and synchrotron radiation photoemission measurements were performed on LiAl. Design, construction, and testing of the soft X-ray APS spectrometer were completed. DOE

N85-26433# North Carolina State Univ., Raleigh. Dept. of Physics.
COMPENSATION OF DANGLING BONDS IN A-Si, Ge:H ALLOYS Annual Report
G. Lucovsky, J. W. Cook, Jr., R. A. Rudder, W. B. Pollard, and S.

Y. Lin Oct. 1984 94 p refs
(Contract DE-AC02-83CH-10093)
(DE85-002905; SERI/STR-211-2475) Avail: NTIS HC A05/MF A01

The deposition of A-Si:H, A-Ge:H and A-Si, Ge:H by dual magnetron sputtering is examined. Principal experimental techniques are infrared and Raman spectroscopy, conductivity, and optical absorption. Theoretical calculations are made using semi-empirical tight-binding Hamiltonians to study bonding defects in A-Si and a Si-based alloys. Theoretical studies of hydrogen and impurity bonding and their associated defect levels are reviewed. DOE

N85-26434# State Univ. of New York, Buffalo.
THIN-FILM POLYCRYSTALLINE SILICON RESEARCH Final Report, Aug. 1983 - Aug. 1984
W. A. Anderson Oct. 1984 64 p refs
(Contract DE-AC02-83CH-10093)
(DE85-002908; SERI/STR-211-2558) Avail: NTIS HC A04/MF A01

This report contains results of research conducted to explore high efficiency Si solar cell design concepts primarily utilizing high quality Si substrates, shallow junctions, and passivated surfaces. Computer aided design was used to select substrate resistivity, implant energy and dose, and A/R coating design. Several possible grid metals were investigated, including magnesium, ytterbium, titanium, and chromium. Ytterbium gave the best results. Several grid designs were used. Textured surfaces were considered to increase short circuit current density. Ion implanted cells were furnace annealed and rapid flash lamp annealed; best results were obtained from furnace annealing. Tests revealed conduction mechanisms for excess currents, which led to improved preparation of solar cell edges and increased efficiency. Three designs, MINP, MNP-P, and MINP-P, were examined. The best implanted cell was the MINP design, with 18.5% AA efficiency and 15.6% TA efficiency. The best diffused cell gave 14.9% AA efficiency and 14.0% TA efficiency. Cl-containing I-layers exhibited improved efficiency, increased UV response, reduced surface state density, and better environmental stability. DOE

N85-25569# Joint Publications Research Service, Arlington, Va.
EFFECT OF AXISYMMETRIC VIBRATION MODES ON SENSITIVITY AND DI RECTIVITY CHARACTERISTICS OF PIEZOCERAMIC SPHERE Abstract Only
M. Ye. Dyubchenko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-85-005) 27 Mar. 1985 p 3-4 refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 4, Jul. - Aug. 1984 p 477-481 (For primary document see N85-25565 15-31)
Avail: NTIS HC A05/MF A01

N85-26301# Joint Publications Research Service, Arlington, Va.
RAMAN SCATTERING OF LIGHT IN EPITAXIAL FILMS OF SOLID PHOSPHIDE-GALLIUM ARSENIDE SOLUTIONS Abstract Only
V. S. Gorelik, R. N. Khashimov, and A. P. Vidanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 1-2 Transl. into ENGLISH from Fiz. i Tekhn. Poluprovodnikov (Leningrad), v. 18, no. 8, Aug. 1984 p 1403-1407 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

N85-26302# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF RECRYSTALLIZATION AND REDISTRIBUTION OF IMPURITIES IN SEMICONDUCTORS SUBJECTED TO MILLISECOND LASER PULSES Abstract Only
S. G. Kiyak, A. K. Shukhostanov, G. V. Savitskiy, S. Zh. Gonov, and V. V. Gafiychuk *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 2 Transl. into ENGLISH from Fiz. i Tekhn. Poluprovodnikov (Leningrad), v. 18, no. 8, Aug. 1984 p 1446-1449 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N85-26435 Stanford Univ., Calif.
GRAVITATIONAL EFFECTS IN THEORIES WITH INTERACTING FIELDS: TWO STUDIES Ph.D. Thesis
Albert Gordon Smith 1984 160 p
Avail: Univ. Microfilms Order No. DA8429553

An exact classical calculation of the gravitationally induced electrostatic self-force on a charged test particle held stationary outside a Schwarzschild black hole is presented. A local analysis involving the energy-momentum tensor in the vicinity of the test particle and a global analysis based on energy conservation both demonstrate that there is a finite repulsive force proportional to the square of the charge of the particle and to the mass of the black hole. Two manifestly covariant methods, one formulated in coordinate space and the other in momentum space, are developed for calculating an approximate finite-temperature effective action for a quantum field theory in a classical curved spacetime. Explicit expressions are obtained for those terms in the one-loop action of an interacting scalar field theory which have at most two derivatives of the background fields. Dissert. Abstr.

N85-26436# New South Wales Univ., Kensington (Australia). School of Mathematics.
SOLUTIONS OF FIELD EQUATIONS IN GENERAL RELATIVITY WITH SPINOR CONNECTION Ph.D. Thesis. Abstract Only
L. A. Peters Sep. 1983 4 p
Avail: NTIS HC A02/MF A01

By defining connection in terms of parallel displacement not of the tangent vector field, but of underlying the spinor field, one finds clear geometric equivalents of both the electromagnetic field and spin. Generalized Einstein-Maxwell-Dirac equations can then be derived from a world Lagrangian, and it has been shown that such a geometry admits oppositely charged particle pairs, neutral particles, bosons, and fermions of arbitrary spin. Three particle solutions of such a geometry are presented here: two spherically symmetric charged particles, one of which has an additional magnetic monopole charge, and an axially symmetric charged particle. Author

N85-26315# Joint Publications Research Service, Arlington, Va.
LOW-TEMPERATURE THERMAL EXPANSION OF GLASS Abstract Only
Yu. M. Galperin, V. L. Gurevich, and D. A. Parshin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 69-70 Transl. into ENGLISH from Pisma v Zh. Eksperim. i Teoreticheskoy Fiz. (Moscow), v. 40, no. 7, 10 Oct. 1984 p 283-286 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N85-26437# National Science Foundation, Washington, D.C. Div. of Science Resources Studies.
CHARACTERISTICS OF RECENT SCIENCE/ENGINEERING GRADUATES, 1982: DETAILED STATISTICAL TABLES
Jun. 1984 118 p
(PB85-149060; NSF-84-318) Avail: NTIS HC A06/MF A01 CSCL 05I

Tables present data on the employment and demographic characteristics of men and women who received a bachelor's or master's degree in science or engineering fields from U.S.

institutions in 1980 and 1981. The data were collected in 1982 and reflect the status of individuals as of the spring of 1982. GRA

N85-26438# National Science Foundation, Washington, D.C. Div. of Science Resource Studies.
ACADEMIC SCIENCE AND ENGINEERING: GRADUATE ENROLLMENT AND SUPPORT, FALL 1982 (DETAILED STATISTICAL TABLES)
May 1984 295 p refs
(PB85-154730; NSF-84-306) Avail: NTIS HC A13/MF A01 CSCL 05I

Data onscience/engineering (S/E) graduate enrollment and postdoctorates for fall 1982, collected at 614 institutions of higher education with graduate S/)E programs. Data on graduate S/E enrollement are tabulated by: (1) enrollment status (full- or part-time); (2) level of study (first year or beyond); (3) field of science/engineering; (4) sex; (5) major sources and types of support; (6) citizenship and racial/ethnic background; (7) control of institutions (public or private); (8) geographic distribution; and (9) institutions ranked by total graduate enrollment. Data on field, sources of support, sex, and citizenship are presented for postdoctorates and other non-faculty doctoral research personnel. Trend tables for most distributions are included. Survey coverage, methodology, and response rates are described and copies of the survey instruments are included. GRA

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N85-26439* National Aeronautics and Space Administration, Washington, D. C.
MANAGEMENT: A BIBLIOGRAPHY FOR NASA MANAGERS
Mar. 1985 183 p
(NASA-SP-7500(19); NAS 1.21:7500(19)) Avail: NTIS HC A08 CSCL 05A

This bibliography lists 706 reports, articles, and other documents introduced into the NASA scientific and technical information system in 1984. Entries, which include abstracts, are arranged in the following categories: human factors and personnel issues; management theory and techniques; industrial management and manufacturing; robotics and expert systems; computers and information management; research and development; economics, costs, and markets; logistics and operations management; reliability and quality control; and legality, legislation, and policy. Subject, personal author, corporate source, contract number, report number, and accession number indexes are included. A.R.H.

N85-26440*# National Aeronautics and Space Administration, Washington, D. C.
THE 1985 LONG-RANGE PROGRAM PLAN
[1984] 247 p refs
(NASA-TM-87464; NAS 1.15:87464) Avail: NTIS HC A11/MF A01 CSCL 05A

That continual evolution of NASA's research and development, is reflected in the missions, goals, and objectives planned for FY1985 and later years, in accordance with the responsibilities by the National Aeronautics and Space Act of 1958, as amended. New starts for the next ten years and space program activities to year 2000 are highlighted including space science and applications, space flight, space station, space tracking and data systems, and space research and technology. Space programs for the early 21st century and aeronautics programs up to and beyond the year 2000 are also covered. A.R.H.

N85-26441# Naval Postgraduate School, Monterey, Calif.
AN APPLICATION OF THE RAYLEIGH DISTRIBUTION TO CONTRACT COST DATA M.S. Thesis
T. S. Abernethy Sep. 1984 79 p
(AD-A151551) Avail: NTIS HC A05/MF A01 CSCL 14/1

Accurate cost models are essential to the proper monitoring of contract cost data. The greater the accuracy of the model, the earlier contract cost overruns can be recognized and their cause(s) ascertained. The availability of a variety of cost models allows flexibility in choosing the correct model for the particular circumstances and increases the chances of being able to select a model that can provide reliable forecasts about future costs. This thesis investigates the possibility of adapting the Rayleigh distribution to cost modelling and develops an APL algorithm which summarizes the results of the application of the Rayleigh model to historical contract cost data. The Rayleigh model was found to be applicable to cost modelling and exhibited some predictive capability in the 21 Navy contracts examined. GRA

N85-26442# Department of Energy, Washington, D. C. Office of Basic Energy Sciences.
SUMMARIES OF FY 1984 ENGINEERING RESEARCH
Dec. 1984 86 p
(DE85-006273; DOE/ER-0158/2) Avail: NTIS HC A05/MF A01

Brief summaries of DOE-sponsored engineering research projects at 71 institutions are given following a review of the Basic Energy Sciences Engineering Research Program. The program addresses advanced industrial technology, fluid dynamics and thermal processes, solid mechanics, and dynamics and control of processes and systems. Emphasis is placed on three carefully selected, high priority research areas: mechanical sciences, including tribology, heat transfer, and solid mechanics; system sciences, including process control and instrumentaton; and engineering analysis, which includes non-linear dynamics, data bases for thermophysical properties of fluids, and modeling of combustion processes for engineering application. DOE

N85-26443# National Science Foundation, Washington, D.C. Universities and Nonprofit Institutions Studies Group.
ACADEMIC SCIENCE AND ENGINEERING: R AND D FUNDS, FISCAL YEAR 1982 (DETAILED STATISTICAL TABLES)
Jun. 1984 157 p refs
(PB85-154763; NSF-84-308) Avail: NTIS HC A08/MF A01 CSCL 05A

Tabular data are presented on 563 institutions of higher education regarding scientific and engineering (S/E) R&D expenditures that are separately budgeted (current-fund expenditures budgeted and restricted specifically to R&D activities during the subject fiscal year). Data are the product of the National Science Foundation's annual Survey of Scientific and Engineering Expenditures at Universities and Colleges, FY-1982. GRA

N85-26462# Astronomisches Inst., Bonn (West Germany).
PHOTOELECTRIC OBSERVATIONS OF THE ECLIPSING BINARY V 836 CYGNI
H. W. Duerback and R. A. Breinhorst (Kitt Peak National Observatory) *In its* Offerings of the Astron. Inst. of Bonn 1984 16 p refs (For primary document see N85-26459 15-89)
(Rept-98) Avail: NTIS HC E04/MF A01

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N85-26444 Maryland Univ., College Park.
A NETWORK-BASED APPROACH TO TEXT HANDLING FOR THE ONLINE SCIENTIFIC COMMUNITY Ph.D. Thesis
Randall Hagner Trigg 1983 149 p
Avail: Univ. Microfilms Order No. DA8429934

Many of the text-based activities of working scientists were recently moved to computers. Eventually the online scientific community will encompass all such activities including text

composition, reader commentary, and electronic journals. The Textnet approach to text organization which lends itself particularly well to both the future scientific community and the need for novel forms of text structuring is described. In particular, the approach captures the notion of nonlinear text, an important structure for future semi-automatic literature handling. This structure is realized by organizing documents as primitive pieces of text connected with typed links to form a network similar in many ways to a semantic net. Hierarchical structures superimposed on the text are incorporated within the same network. In addition, a taxonomy of link types is presented which captures the essential relationship between pieces of text comprising scientific text and commentary. The TEXTNET system was designed to encapsulate these ideas at the local single-computer level. Dissert. Abstr.

N85-26445*# National Aeronautics and Space Administration, Washington, D. C.
NASA PHOTOGRAPHY INDEX
1983 207 p
(NASA-TM-87457; NAS 1.15:87457) Avail: NTIS HC A10/MF A01 CSCL 05B

An index of photographs and descriptions of their content from various NASA missions is presented. All photographs are available free to the media upon request and for sale to the general public. G.L.C.

N85-26446# Council for Scientific and Industrial Research, Pretoria (South Africa).
PROCEDURES FOR USE IN COMPILING REQUIREMENTS SPECIFICATIONS FOR COMPUTERIZED LIBRARY SYSTEMS
N. M. Lodder Jan. 1984 31 p refs
(CSTI-76) Avail: NTIS HC A03/MF A01

The compilation of a requirements specification forms an important part of the overall process of developing a computerized library system or of evaluating computerized systems being considered for use in a particular library. This is because such a specification provides a clear and concise statement of what the users of the system consider it should achieve. It therefore provides a means of communication amongst the various people involved in the development or evaluation of the system which should ensure a clear understanding of what is expected of the system. Procedures are discussed which are suitable for use in a methodology for the determination and specification of the requirements to be met by a proposed computerized library system. G.L.C.

N85-26447# New South Wales Univ., Kensington (Australia). School of Librarianship.
DOCUMENT RETRIEVAL FROM A RELATIONAL DATABASE MANAGEMENT SYSTEM: AN INVESTIGATION OF MULTIPLE-LINE QUERY FORMULATION USING SEQUEL M.S, Thesis. Abstract Only
T. J. Rugg Feb. 1983 2 p
Avail: NTIS HC A02/MF A01

The design and implementation of a working document retrieval system based on a commercial relational database management system is reviewed. Free-text retrieval is supported from a database of energy-related patent documents. Multiple line query formulation of the type generally found in special-purpose document retrieval software has been provided. This is done through the use of macros which provide a parametric user-interface to the database enabling search intermediaries such as librarians and document retrieval specialists to interrogate the database in a manner similar to the way in which they interrogate special purpose document retrieval systems. The macros translate parametric queries into SEQUEL commands suitable for processing by the database management system. G.L.C.

N85-26448# Office of Naval Research Liason Office, Far East, APO, San Francisco, Calif.
ONR (OFFICE OF NAVAL RESEARCH) FAR EAST SCIENTIFIC BULLETIN, VOLUME 9, NUMBER 4, OCTOBER-DECEMBER 1984
N. A. Bond, Jr. and M. L. Moore Dec. 1984 144 p
(AD-A151274) Avail: NTIS HC A07/MF A01 CSCL 05/2

This quarterly publication presents articles covering recent developments in Far Eastern (particularly Japanese) scientific research. Topics in this issue include: A Survey on Semiconductor Research in Japanese Universities; Recent Accomplishments in Semiconductor Research in Japan; An Australian Approach to Development of Manufacturing Technology; Conference on High-Strength Low-Alloy Steels; Welding Technology and High-Strength Steels for Marine Structures-Visits to Japanese Shipyards; Marine Science in New Zealand Government Laboratories; The Sixth Australian Electrochemistry Conference; Conference on Photochemical Conversion and Storage of Solar Energy; A Visit to ICOT (Inst. for New Generation Technology) and a Note on the 29th National Meeting of the Japan Information Processing Society; Japan Science and Technology--An Overview; Symposium on Chronobiology; Symposium on Wave Breaking, Turbulent Mixing, and Radio Probing of the Ocean Surface. GRA

N85-26449# Naval Postgraduate School, Monterey, Calif.
MEAN CONDITIONS AND TURBULENCE STATISTICS AT VANDENBERG AFB, CALIFORNIA
G. E. Schacher, C. E. Skupniewicz, and M. Buell Nov. 1984 105 p
(AD-A151366; NPS61-85-003) Avail: NTIS HC A06/MF A01 CSCL 05/2

This report describes the results of a one-year program to gather meteorological data at Vandenberg AFB, CA. The purpose of the program was to obtain data that would allow characterization of the mean flow and turbulence in complex terrain. One full year of data, 24 hours a day, was obtained so that the full range of meteorological conditions at the site would be experienced and to establish statistical validity. The principal goal of the study is to characterize the turbulence, providing a data base for modeling diffusion in complex terrain. Immediate applications being addressed are: Space Shuttle exhaust hazard, site specific diffusion at Vandenberg, and generic features of flow and turbulence in complex, coastal terrain. Because the data may ultimately be used for modeling a wide variety of situations, such as continuous plumes, burst releases, rocket exhaust, the data acquisition procedures must be well designed. Specifically, sampling must be done so that the full range of the turbulence spectrum that is important for all types of diffusion is acquired. The purpose of this report is to describe the status of the data that has been obtained and to outline how to use it. Auxiliary data has been obtained and several analyses have been performed. These are also described. GRA

N85-26450# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DESIGN AND IMPLEMENTATION OF THE DIGITAL ENGINEERING LABORATORY DISTRIBUTED DATABASE MANAGEMENT SYSTEM M.S. Thesis
J. G. Boeckman Dec. 1984 142 p
(AD-A151694; AFIT/GCS/ENG/84D-5) Avail: NTIS HC A07/MF A01 CSCL 09/2

This effort produced a basic design and partial implementation of a distributed database management system (DDBMS) for use in the AFIT Digital Engineering Laboratory. The objectives of this thesis were to lay out the requirements for a DDBMS, to design a simplified implementation of one, and to accomplish a partial implementation of that design. The requirements analysis used the Structured Analysis and Design Technique (SADT) to document the DDBMS requirements. The analysis, independent of any hardware or specific algorithmic implementation, covers all aspects of a DDBMS, including routing and execution of queries and updates, DDBMS initialization and reconfiguration, and recovery from network malfunctions. The detailed design expanded the SADT diagrams of the requirements analysis for specific methods of executing queries and updates in the DDBMS. These methods were selected to limit the scope of that design. Structure charts were produced using the SADT diagrams as a reference, specifying parameters and algorithms for the modules. Only the part of the design that handles DDBMS queries was implemented. The

implementation was greatly simplified to exclude partitioning and optimization. Two DDBMS nodes were connected via the Digital Engineering Laboratory network. These were, in turn, connected to host computers that evaluate queries and return the resulting relation. Author (GRA)

N85-26451# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DEVELOPING AN AUTOMATED TECHNIQUE FOR TRANSLATING A RELATIONAL DATABASE INTO AN EQUIVALENT NETWORK ONE M.S. Thesis
E. Y. Aly Dec. 1984 121 p
(AD-A151844; AFIT/GCS/MATH/84D-4) Avail: NTIS HC A06/MF A01 CSCL 09/2

This thesis developed an automated technique for translating a relational schema into an equivalent network one. In addition to the usual translation applications, this technique is the major step towards developing the multi-model data base management system which enables implementing both relational and network databases via one system, allows the use of either relational or network commands, solves the problem of converting applications, and eases the communication between data base management systems. Reviewing the previous efforts in that field, there are two algorithms that were developed for the same objective. Each one was discussed explained, and used to solve an illustrative example. Both algorithms were compared and one was chosen as a basis for developing the automated technique. The chosen algorithm was modified to suit the requirements, and analyzed and decomposed using the SADT (Structural Analysis and Design Technique). The automated technique was developed and coded in PASCAL. In its development, it was considered to be user friendly, and to produce the network schema in a suitable format. The developed technique was tested and implemented using a relational schema in the third normal form. The resulting network schema was efficient, nonredundant, and had the minimum and necessary number of record types and sets as it was supposed to be. GRA

N85-26452# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A DATABASE DESIGN FOR THE BRAZILIAN AIR FORCE FLYING UNIT OPERATIONAL CONTROL SYSTEM M.S. Thesis
A. M. DACunha 14 Dec. 1984 256 p
(AD-A151848; AFIT/GCS/ENG/84D-7) Avail: NTIS HC A12/MF A01 CSCL 09/2

This thesis addresses a relational database design for a Brazilian Air Force Flying Unit Operational Control System. After defining the problem and specifying requirements, an overall system analysis was performed using Decision Support System Theory. A top-down planning for decision support systems and databases, and a functional analysis were performed to identify potential environmental database applications. Using a canonical approach, a file management systme was mapped to a database conceptual model and afterwards to a database logical model. A prototype Dialog Generator Management Software was implemented through menu driven programs, using the dBASE II DBMS version 2.1 running on a Z-80 microcomputer. The database partial implementation was performed using the INGRES DBMS version 7.10 running on a VAX 11/780, from which advanced queries were retrieved. Finally, an investigation of optimum query retrievals from databases is performed using Artificial Intelligence methods and techniques. GRA

N85-26453# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ANALYSIS AND SPECIFICATION OF A UNIVERSAL DATA MODEL FOR DISTRIBUTED DATA BASE SYSTEMS M.S. Thesis
A. J. Jones 14 Dec. 1984 300 p
(AD-A151856; AFIT/GCS/ENG/84D-11) Avail: NTIS HC A13/MF A01 CSCL 09/2

A Universal Data Model (UDM) was developed for distributed Data Base Management Systems (DBMS). The primary goal was to allow for the effective communication between heterogeneous, distributed DBMS's. A system requirements analysis was first performed for a Universal Data Base (UDB). Three models were selected and investigated as candidates for the UDM: the Canonical, Entity-Relationship, and Relational. Due to the complexities of the UDB, the user was restricted to writing universal queries in a Universal Data Manipulation Language (UDML) and was restricted to only one version of each of the three prominent data models in use: IMS (hierarchical), DBTG (network), and System R (relational). Criteria were established and the relational model, augemented, chosen as the UDM. Data model mapping issues were examined and included discussions on distributed information, redundant data, the support of Third Normal form, and target model specific issues. Algorithms were developed to show the mappings between the target models and the UDM. The integration of these mappings were also addressed. The syntax of a universal data definition language and data manipulation language were described. GRA

N85-26454# Department of Energy, Oak Ridge, Tenn. Office of Scientific and Technical Information.
ENERGY DATA BASE: SUBJECT THESAURUS PERMUTATED LISTING. REVISION 6, APPENDIX
Julio S. Redford, ed. Nov. 1984 252 p
(DE84-016963; DOE/TIC-7000/R6-App) Avail: NTIS HC A12/MF A01

The Office of scientific and technical information, in its role of managing scientific and technical information in support of DOE programs, develops and maintains a standardized vocabulary for indexing this information. This permutated listing, an appendix to the energy data base; subject thesaurus (DOE/TIC-7000-R6), was prepared to alleviate the problems of entry to a large multidisciplinary thesaurus containing both single and multiword descriptors. It is designed to be used in conjunction with the subject thesaurus and is not to be used alone. E.A.K.

N85-26455# National Library of Medicine, Bethesda, Md.
LIST OF SERIALS INDEXED FOR ONLINE USERS, 1985
Feb. 1985 166 p
(PB85-143220; NLM/MED-85/01) Avail: NTIS HC A08/MF A01 CSCL 05B

Complete bibliographic information on serials and Congress proceedings cited in three MEDLARS files: MEDLINE (including the backfiles), Health Planning and Administration, and POPLINE are provided. A listing for 6,260 records by full title is contained. GRA

N85-26190# Ninham Shand, Inc. (South Africa).
MANAGEMENT COMMUNICATION AND FINANCIAL MODELING
H. N. P. Pells *In* South African Inst. of Civil Engineering Symp. on Computers in Civil Eng., 1983 1983 10 p refs (For primary document see N85-26182 15-61)
Avail: NTIS HC A10/MF A01

N85-25620# Joint Publications Research Service, Arlington, Va.
PHILIPS TESTED NEW MATERIALS FOR OPTICAL DATA STORAGE
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-026) 1 Aug. 1984 p 29-30 Transl. into ENGLISH from Frankfurter Zeitung/Blick Durch die Wirtsch. (Franfurt am Main), 4 Jun. 1984 p 7 (For primary document see N85-25617 15-31)
Avail: NTIS HC A04/MF A01

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N85-26456# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
LIFE CYCLE COSTING IN GOVERNMENT PROCUREMENT M.S. Thesis
D. H. Shaw May 1985 230 p

(AD-A151878; AFIT/CI/NR-85-30T) Avail: NTIS HC A11/MF A01 CSCL 15/5

In the area of government procurement, Life Cycle Costing involves the consideration of post-acquisition costs, such as maintenance and operating expenses, in the making of decisions regarding the acquisition of goods and services. This thesis focuses on the use of life cycle costing techniques in determining the method of contracting and/or the determination of the recipient of a government contract in a competitive procurement in order to minimize the total cost of the acquisition from purchase to final disposal. Emphasis is given to an examination of the interaction of the practical and legal constraints under which life cycle cost applications must operate. This examination is facilitated through a discussion of the concept and theory of life cycle costing and a review of the factors to be considered in deciding which procurements may benefit from its use. The development of evaluation criteria and its incorporation into a solicitation is also treated in detail. Finally, the use of mechanisms to prevent bidder from gaming such an evaluation is given concise treatment, including the use of post award price adjustment and warranty provisions to achieve this purpose. Within this organizational framework, the thesis deals with the current constraints on the use of life cycle costing arising from various statutory requirements and the procurement guidance issued via Comptroller General Decisions. Although federal procurement materials form the basis for the majority of this work, treatment is also given to state procurement policies. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N85-25360# Joint Publications Research Service, Arlington, Va.
MILITARIZATION OF SPACE ACTIVITY IN UNITED STATES
O. Mikhaylov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 137-144 Transl. into ENGLISH from Politicheskoye Samoobrazovaniye (USSR), no. 6, Jun. 1984 p 115-120 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N85-26457# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
INFORMATION TECHNOLOGY APPLICATIONS IN VOLUNTARY SECTOR TRANSPORT OPERATIONS. SP1: OBJECTIVES AND PROGRAMME OF WORK
D. Gillingwater and J. Sutton Mar. 1985 13 p refs
(TT-8501) Avail: NTIS HC A02/MF A01

The practical application of information technology to improve the effectiveness of the operation of transport services organized by the voluntary sector is to be demonstrated and evaluated. The objectives are as follows: to identify existing operational problems with and barriers to the application of information technology to voluntary sector transport initiatives; to demonstrate the scope and feasibility, and identify the limitations, of the use of personal computers in, for example, facilitating vehicle sharing and improving vehicle utilization; to evaluate, through selected case studies, the relative merits of mini- and micro-computer use in providing a more effective operation through the application of data base management, financial management, performance evaluation, and word processing facilities; and to disseminate the practical relevance and feasibility of information technology applications in voluntary sector transport initiative through the medium of intensive training packages for community transport managers and operators, and the provision of guidelines for agencies and groups funding such schemes. Author

N85-26458# Argonne National Lab., Ill. Energy and Enviromental Systems Div.
FIELD USE OF ELECTRIC VEHICLES COMPARED TO PROTOTYPE TESTS
Sarah J. LaBelle Nov. 1984 16 p refs Presented at the 64th Ann. Transport. Res. Board Meeting, Washington, D.C., 21 Jan. 1985
(Contract W-31-109-eng-38)
(DE85-006887; CONF-850115-6) Avail: NTIS HC A02/MF A01

Data on six types of electric vehicle are presented. Energy use and geographic range information gleaned from early verification and characterization tests are compared with operational data collected under the US Department of Energy Test and Evaluation Program. Track test data are an uneven indicator of performance in the field. This is mainly due to the unpredictability of breakdowns in vehicles, and the importance of management practices at the test sites. These data present a good picture of electric vehicle characteristics today. A brief summary of usage patterns of the electric vehicles in the test program, highlighting successful missions in the field is included. DOE

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N85-26459# Astronomisches Inst., Bonn (West Germany).
OFFERINGS OF THE ASTRONOMICAL INSTITUTE OF BONN
1984 37 p refs In ENGLISH and GERMAN Document includes a microfiche supplement
Avail: NTIS HC E04/MF A01

Photoelectric observations of binary stars are presented. Specific bodies include contact binaries, the dwarf nova VW Hydri, and the eclipsing binary V 836 Cygni. For individual titles, see N85-26460 through N85-26462.

N85-26460# Astronomisches Inst., Bonn (West Germany).
PHOTOELECTRIC OBSERVATIONS OF CONTACT BINARY STARS
M. Hoffmann *In its* Offering of the Astron. Inst. of Bonn 1984 9 p refs In GERMAN; ENGLISH summary (For primary document see N85-26459 15-89)
(Rept-96) Avail: NTIS HC E04/MF A01

Photoelectric measures of contact binaries obtained in the years 1976 through 1983 at the European Southern Observatory and at the Hoher List Observatory of the University of Bonn are presented. Data for 41 objects are given in table form. M.G.

N85-26461# Astronomisches Inst., Bonn (West Germany).
PHOTOELECTRIC OBSERVATIONS OF THE DWARF NOVA VW HYDRI DURING THE NOVEMBER 1977 SUPERMAXIMUM
H. W. Duerback and N. Vogt (European Southern Observatory, La Silla, Chile) *In its* Offerings of the Astron. Inst. of Bonn 1984 11 p refs In GERMAN; ENGLISH summary (For primary document

see N85-26459 15-89)
(Rept-97) Avail: NTIS HC E04/MF A01

photoelectric UBV observations of the dwarf nova VW Hydri were obtained with the ESO (European Southern Observatory) 0.5 m telescope during 17 nights in November 1977; CPD-71 deg 248 served as a comparison star. Since a standard single channel photometer was used, the observations in U, B and V were obtained consecutively. The U and B observations were reduced by linear interpolation to the time of the V observations. The light and color curves of the dwarf nova during its decline from the supermaximum are given. M.G.

N85-26462# Astronomisches Inst., Bonn (West Germany).
PHOTOELECTRIC OBSERVATIONS OF THE ECLIPSING BINARY V 836 CYGNI c81
H. W. Duerback and R. A. Breinhorst (Kitt Peak National Observatory) *In its* Offerings of the Astron. Inst. of Bonn 1984 16 p refs (For primary document see N85-26459 15-89)
(Rept-98) Avail: NTIS HC E04/MF A01

Photoelectric UBV observations of the eclipsing binary V 836 Cygni are reported. The observations were obtained with the 0.35 m Cassegrain telescope of the Hoher List Observatory in 1971 and 1976, and with the No. 3 0.40 m telescope of the Kitt Peak National Observatory in 1980. General data of the variable, comparison, and check stars are given along with differential UBV magnitudes. M.G.

N85-26463*# California Inst. of Tech., Pasadena. Div. of Physics, Mathematics and Astronomy.
IRAS OBSERVATIONS OF ACTIVE GALAXIES
G. Neugebauer, B. T. Soifer, and M. Rowan-Robinson (Queen Mary Coll.) [1985] 18 p refs Sponsored by NASA, Netherlands Agency for Aerospace Programs, and UK Science and Engineering Research Council
(NASA-CR-175720; NAS 1.26:175720) Avail: NTIS HC A02/MF A01 CSCL 03A

The IRAS survey gives an unbiased view of the infrared properties of the active galaxies. Seyfert galaxies occupy much the same area in color-color plots as to normal infrared bright galaxies, but extend the range towards flatter 60 to 25 mm slopes. Statistically the Seyfert 1 galaxies can be distinguished from the Seyfert 2 galaxies, lying predominantly closer to the area with constant slopes between 25 and 200 mm. The infrared measurements of the Seyfert galaxies cannot distinguish between the emission mechanisms in these objects although they agree with the currently popular ideas; they do provide a measure of the total luminosity of the Seyferts. The quasar's position in the color-color diagrams continue the trend of the Seyferts. The quasar 3C48 is shown to be exceptional among the radio loud quasars in that it has a high infrared luminosity which dominates the power output of the quasar and is most likely associated with the underlying host galaxy. Author

N85-26464# California Inst. of Tech., Pasadena. Div. of Physics, Mathematics and Astronomy.
THE INFRARED ASTRONOMICAL SATELLITE
G. Neugebauer [1985] 33 p refs
Avail: NTIS HC A03/MF A01

The Infrared Astronomy Satellite is discussed. Observations and results of an all sky survey are included. Stars, quasars, and galaxies are discussed. Photographs are presented. R.J.F.

N85-26465*# Alabama Univ., Huntsville.
INFRARED TELESCOPE Final Technical Report
Gerald R. Karr and John B. Hendricks 1985 151 p refs
(Grant NAS8-32818)
(NASA-CR-171392; NAS 1.26:171392; UAH-RR-427) Avail: NTIS HC A08/MF A01 CSCL 03A

The development of the Infrared Telescope for Spacelab 2 is discussed. The design, development, and testing required to interface a stationary superfluid helium dewar with a scanning cryostate capable of operating in the zero-g environment in the space shuttle bay is described. G.L.C.

N85-26466# Columbia Univ., New York. Astrophysics Lab.
A PROGRAM OF GROUND-BASED ASTRONOMY TO COMPLEMENT EINSTEIN OBSERVATIONS Annual Scientific Report, 1 Oct. 1983 - 30 Sep. 1984
D. J. Helfand 30 Nov. 1984 22 p
(Grant AF-AFOSR-0014-82)
(AD-A151111; CAL-1553; AFOSR-85-0180TR; Rept-82-00208) Avail: NTIS HC A02/MF A01 CSCL 03/2

The objective of the funded research is the formulation and execution of ground-based astronomical observations and interpretive studies complementary to the X-ray data accumulated with the Einstein satellite, to be used in addressing a number of questions of current astrophysical interest. During the past year, the program focussed on two main topics: the processes leading to high energy emission in the winds and coronae of late-type stars, and the structure and evolution of supernova remnants and the neutron stars they may contain. The stellar work encompasses the development of a complete, X-ray flux-limited sample of stars which, when combined with our complete, magnitude-limited optical sample will provide the best available description of the distribution of coronal activity in stars of spectral types F through M. A principal corollary of this work is the determination of the contribution of coronally active M-dwarfs to the diffuse X-ray background. Star cluster studies are combined with the survey work toward the goal of specifying the critical factors governing the production and evolution of magnetically dominated coronae in late-type stars. The supernova remnant work concentrates on the twin problems of the evidence for and frequency of neutron star formation in supernova explosions and the time development of the luminosity and size of the expanding supernova shock wave. GRA

N85-25286# Joint Publications Research Service, Arlington, Va.
ANGULAR ERROR OF POSITION OF RATAN-600 SCREENS DURING RADIAL DISPLACEMENT Abstract Only
Y. K. Zverev *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 13 Transl. into ENGLISH from Geod. i Kartograf. (USSR), no. 8, Aug. 1984 p 17-21 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25298# Joint Publications Research Service, Arlington, Va.
INVESTIGATING STATISTICAL CHARACTERISTICS OF ATMOSPHERIC BACKGROUND BRIGHTNESS AND STAR BACKGROUND DENSITY IN EQUATORIAL REGION OF CELESTIAL SPHERE Abstract Only
S. I. Vereshchagin *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 21-22 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geodeziya Aerofitosyemka (USSR), no. 2, Mar.-Apr. 1984 p 56-60 Original language document announced as A84-40000 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25351# Joint Publications Research Service, Arlington, Va.
COMPUTING PARAMETERS CHARACTERIZING POSSIBILITY OF PLANETS FALLING IN STAR CAMERA FIELD OF VIEW DURING SPACE SURVEY Abstract Only
I. G. Zhurkin and V. A. Kuzminykh *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 115-116 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geod. i Aerofotosyemka (USSR), no. 3, May-Jun. 1984 p 85-89 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25352# Joint Publications Research Service, Arlington, Va.
ONE ASPECT OF DETERMINATION OF DIRECTION OF SPACE SURVEY BASE FROM PHOTOGRAPHS OF PLANETARY SURFACE AND STAR SKY Abstract Only
M. I. Shcherbakov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 116-117 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Geod. i Aerofotosyemka (USSR), no. 3, May-Jun. 1984 p 76-78 Original language document announced as A84-46465 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-26568*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TELESCOPE IN LUNAR ORBIT Abstract Only
Thornton Page *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 68-70 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03A

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N85-26467 Toledo Univ., Ohio.
STELLAR SURFACE PHENOMENA: A SPECTROSCOPIC STUDY OF THE RS CANUM VENATICORUM BINARIES Ph.D. Thesis
Scott Edward Smith 1984 312 p
Avail: Univ. Microfilms Order No. DA8429741

High resolution observations of the Ca II H and K and H(alpha) regions in a selection of twenty-five RS CVn and related CaII emission objects are reported. The RS CVn stars have Ca II H and K and H(alpha) line surface fluxes and chromospheric loss rates over an order of magnitude larger than standard stars for their respective spectral types and luminosity classes. In the short-period systems these line surface fluxes and chromospheric loss rates were found to be well correlated with the fraction of the Roche lobe filled by the active star in the system and the separation between the stars. The chromospheric temperature structure in the lower chromosphere was mapped out. The RS CVn stars were found to have steeper than normal chromospheric temperature gradients. Several systems were also found which showed Ca II H and K emission but not H(alpha) emission. Finally, the stars in RS CVn binaries were found to be rotating with values of v sin i consistent with synchronous rotation. These observations were found to be fit best by a model which suggests an intimate relationship between rotation, convection, and duplicity in determining levels of stellar surface activity. Dissert. Abstr.

N85-26468*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECTRAL CONSTRAINTS ON MODELS OF GAS IN CLUSTERS OF GALAXIES
Mark J. Henriksen (Maryland Univ., College Park) and Richard F. Mushotzky May 1985 11 p refs Presented at the 18th ESLAB Symp. on X-Ray Astronomy, The Hague, 5-9 Nov. 1984 Submitted for publication
(NASA-TM-86188; NAS 1.15:86188; Rept-85B0201) Avail: NTIS HC A02/MF A01 CSCL 03B

The HEAO 1A2 spectra of clusters of galaxies are used to determine the temperature profile which characterizes the X-ray emitting gas. Strong evidence of nonisothermality is found for the Coma, A85, and A1795 clusters. Properties of the cluster potential which binds the gas are calculated for a range of model parameters. The typical binding mass, if the gas is adiabatic, is 2-4E14 solar masses and is quite centrally concentrated. In addition, the Fe abundance in Coma is .26 + or - .06 solar, less than the typical value (.5) found for rich clusters. The results for the gas in Coma may imply a physical description of the cluster which is quite different from what was previously believed. Author

N85-26469# Fermi National Accelerator Lab., Batavia, Ill. Astrophysics Theory Group.
SU(N,1) INFLATION
John Ellis (CERN, Geneva), K. Engvist (CERN, Geneva), D. V. Nanopoulos (CERN, Geneva), K. A. Olive, and M. Srednicki (California Univ., Santa Barbara) Nov. 1984 9 p refs Sponsored in part by the Academy of Finland
(Contract DE-AC02-76CH-03000; Grant NSF PHY-83-13324)
(DE85-003952; FNAL/Pub-84-126-A) Avail: NTIS HC A02/MF A01

A simple model for primordial inflation in the context of SU(N,1) no-scale n = 1 supergravity is given. Because the model at zero temperature very closely resembles global supersymmetry, minima with negative cosmological constants do not exist, and it is easy to have a long inflationary epoch while keeping density perturbations of the right magnitude and satisfying other cosmological constraints. Specific attention is paid to satisfying the thermal constraint for inflation, i.e., the existence of a high temperature minimum at the origin. DOE

N85-26470# Los Alamos Scientific Lab., N. Mex. Earth and Space Sciences Div.
WINDS IN CATACLYSMIC VARIABLE STARS
France A. Cordova, Edwin F. Ladd, and Keith C. Mason (University College, London) 1984 24 p refs Presented at the Am. Inst. of Phys. Conf., Taos, N. Mex., 6-11 Aug. 1984 Sponsored in part by UK Science and Enigneering Research Council
(Contract W-7405-eng-36)
(DE85-006708; LA-UR-85-285; CONF-8408121-3) Avail: NTIS HC A02/MF A01

Ultraviolet spectrophotometry of two dwarf novae, CN Ori and RX and, at various phases of their outburst cycles confirms that the far UV flux increases dramatically about 1 to 2 days after the optical outburst begins. At this time the UV spectral line profiles indicate the presence of a high velocity wind. The detectability of the wind depends more on the steepness of the spectrum, and thus on the flux in the extreme ultraviolet, than on the absolute value of the far UV luminosity. The UV continuum during outburst consists of at least two components, the most luminous of which is located behind the wind and is completely absorbed by the wind at the line frequencies. Several pieces of evidence suggest that the UV emission lines that are observed in many cataclysmic variables during quiescence have a different location in the binary than the wind, and are affected very little by the outburst. DOE

N85-26471# Los Alamos Scientific Lab., N. Mex.
MEASUREMENT AND THEORY OF TURBULENCE IN RR LYRAE
Willy Benz and Robert F. Stellingwerf (Mission Research Corp., Albuquerque, N. Mex.) 1985 22 p refs Presented at the 165th Am. Astrophys. Soc. Meeting, Tucson, Ariz., 13-16 Jan. 1985 Sponsored in part by Swiss National Science Foundation
(Contract W-7405-eng-36; Grant NSF AST-11029)
(DE85-005899; LA-UR-85-97; CONF-850135-2) Avail: NTIS HC A02/MF A01

CORAVEL observations of time dependent turbulence in RR Lyrae are presented. Variation in the width of the mean velocity correlation function implies turbulent velocities that peak at 10 to 15 km/sec for a brief interval of phase near minimum radius. Comparison with a nonlinear pulsation model shows that these amplitudes of the turbulent velocity are expected near the hydrogen ionization zone, again only near minimum radius. DOE

N85-25304# Joint Publications Research Service, Arlington, Va.
CONSTRUCTION OF CONDITIONALLY PERIODIC SOLUTIONS OF PROBLEM OF RECIPROCATING MOTION OF AXIALLY SYMMETRIC SATELLITE OF TRIAXIAL PLANET Abstract Only
A. A. Zlenko *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 25-26 Transl. into ENGLISH from Kosmicheskiya Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 531-536 Original language document announced as A84-48005 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-26312# Joint Publications Research Service, Arlington, Va.
SOLAR WIND AND COSMIC RAIN
B. Konovalov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-003) 11 Apr. 1985 p 40-43 Transl. into ENGLISH from Izv. (Moscow), 3 Sep. 1984 p 3 (For primary document see N85-26300 15-70)
Avail: NTIS HC A05/MF A01

N85-26551*# Rice Univ., Houston, Tex.
INTERSTELLAR Al-26 AND EXCESS Mg-26 Abstract Only
Donald D. Clayton *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 9-11 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

N85-26555*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PERIODIC COMETARY SHOWERS: REAL OR IMAGINARY? Abstract Only
R. A. F. Grieve (Dept. of Energy, Mines and Resources, Ottawa), V. L. Sharpton (Dept. of Energy, Mines and Resources, Ottawa), A. K. Goodacre (Dept. of Energy, Mines and Resources, Ottawa), and J. B. Garvin *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 24-27 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

N85-26556*# Max-Planck-Inst. fuer Kernphysik, Heidelberg (West Germany).
DUST EMISSION OF COMET HALLEY AT LARGE HELIOCENTRIC DISTANCES Abstract Only
E. Gruen, G. Schwehm (ESA. European Space Operations Centre, Darmstadt, West Germany), Lutz Massonne (ESA. European Space Operations Centre, Darmstadt, West Germany), Juergen Fertig (ESA. European Space Operations Centre, Darmstadt, West Germany), and U. Graser (Max-Planck-Inst. fuer Astronomie, Heidelberg) *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 28-31 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

N85-26563*# Centre National de la Recherche Scientifique, Orsay (France).
MINING COSMIC DUST FROM THE BLUE ICE LAKES OF GREENLAND Abstract Only
M. Maurette, D. E. Brownlee (Washington Univ., Seattle), L. Fehrenback, C. Hammer (Copenhagen Univ.), C. Jehano (CNRS, Gif-sur-Yvette, France), and H. H. Thomsen (Grolands Geologiske Undersoegelse, Copenhagen) *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 51-53 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

N85-26569*# Chicago Univ., Ill.
A SPECTACULAR NITROGEN ISOTOPE ANOMALY IN BENCUBBIN Abstract Only
Carol A. Prombo and Robert N. Clayton *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 71-73 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N85-26472 New Mexico State Univ., University Park.
ANALYSIS OF MOTIONS OF JUPITER'S GREAT RED SPOT AND WHITE OVALS Ph.D. Thesis
Hunt Guitar 1985 160 p
Avail: Univ. Microfilms Order No. DA8501892

Self-consistent longitude and latitude measurements of Jupiter's Great Red Spot and white ovals made from photographic plates obtained in the course of twenty years of operation of New Mexico State University's planetary patrol program are analyzed. The zonal motions of all four cloud systems are characterized by abrupt accelerations followed by long periods of recovery. The Great Red Spot's 90-day period zonal oscillation has persisted with no significant phase shift throughout the entire time interval, and a new determination of its parameters is presented. No such dominant single-frequency oscillations were found in the zonal motions of the ovals, although weak modes are suggested during limited time intervals. Evidence is presented which may associate the episodic zonal behavior with deep-seated convective activity. A significant degree of meridional interaction between the Great Red Spot and ovals is shown to exist, confirming earlier indications. Dissert. Abstr.

N85-26473 Centre National d'Etudes Spatiales, Toulouse (France).
PLANETARY RINGS. COLLOQUIUM 75
Andre Brahic, ed. (Paris VII Univ.) 1982 767 p refs Partly in ENGLISH and FRENCH Colloq. held in Toulouse, 30 Aug. - 2 Sep. 1982; sponsored by International Astronomical Union, CNES, COSPAR and Societe Francaise des Specialists d'Astronomie Original contains color illustrations
(ISSN-2-85428-100-4) Copyright. Avail: CEPADUES, Toulouse, France

Ground-based and spaceborne observations of planetary rings; gravitational and collisional theories of planetary rings; electromagnetic theories and small particles; formation of rings and asteroids; and ring exploration projects were discussed. For individual titles, see N85-26474 through N85-26543.

N85-26474 Cornell Univ., Ithaca, N.Y. Dept. of Astronomy.
A REVIEW OF RADAR OBSERVATIONS OF SATURN'S RINGS
Steven J. Ostro and Gordon H. Pettengill (Massachusetts Inst. of Tech., Cambridge) *In* CNES Planetary Rings 1982 p 49-55 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

Radar studies of Saturn's rings using 3.5 and 12.6 cm wavelength systems are reviewed. Using radiative transfer techniques and allowing for the phase functions of nonspherical particles, theoretical radar reflectivities for monolayer and extended-layer ring models were calculated. Calculations demonstrate that the high reflectivities at 3.5 and 12.6 cm exclude silicates (but permit ice or metal) as the principal component of ring particles. Radar data suggest that the particles responsible for radar echoes are distributed in a many-particle thick layer. Author (ESA)

N85-26475* California Inst. of Tech., Pasadena.
MICROWAVE EMISSION FROM SATURN'S RINGS
D. O. Muhleman and G. L. Berge *In* CNES Planetary Rings 1982 p 57-70 refs (For primary document see N85-26473 15-91)
(Grants NGR-005-002-114; NGL-05-002-003; NSF AST-79-11806)
Avail: CEPADUES, Toulouse, France CSCL 03B

Passive radio measurements of Saturn's rings are reviewed and interferometric measurements at 2.7 mm are presented. The brightness temperatures of the A plus B rings at a rings angle of B = 10 deg are found to be 17 and 38 K in separate experiments, the latter being the more reliable. Results are interpreted in terms of ring particle emission and scattering of the planet's disk emission by the rings. Author (ESA)

N85-26476* Arizona Univ., Tucson. Linear and Planetary Lab.
SATURN'S RINGS RESOLVED BY THE VLA
Imke dePater and John B. Dickel (Illinois Univ., Urbana) *In* CNES Planetary Rings 1982 p 71-74 refs (For primary document see N85-26473 15-91)
(Grants NsG-7558; NGR-14-005-176)
Avail: CEPADUES, Toulouse, France CSCL 03B

High resolution radio data of Saturn were obtained at 1.3, 2, 6, and 21 cm, at different inclination angles of the ring plane. Results on optical depth measurements in the rings are described. There is no wavelength dependence in the optical depth of the rings between 1.3 and 6 cm. This indicates that there are not many small particles (sizes of a few centimeters) in the B-ring, which ring is responsible for most of the observed obscuration. This result agrees with the Voyager radio occultation experiment. Author (ESA)

N85-26477 Paris VII Univ. (France).
APPARENT THICHNESS OF SATURN'S RINGS FROM THE OBSERVATIONS OF THE RING PLANE CROSSING
Bruno Sicardy, Pierre Laques (Observatoire du Pic du Midi, Bagneres de Bigorre, France), Jean Lecacheux (Observatoire de Paris-Meudon, France), Andre Brahic, and Gerard Wierick (Observatoire de Paris-Meudon, France) *In* CNES Planetary Rings 1982 p 75-86 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

Reductions of electronographic plates taken during ground-based observations of Saturn at Sun and the Earth transits through the ring plane are interpreted. Variation of ring brightness vs. elevation angle around Earth's crossing is different from the variation around Sun's crossing. Ring brightness increases with the distance to Saturn's center around Earth's crossing and decreases around Sun's crossing. This is used to derive the illumination of the Saturn disk on the rings and indicates that the rings do not behave like an homogeneous scattering layer when observed or lit almost edge-on. On plates taken very close to the Earth transit, a residual flux clearly remains, giving an equivalent thickness of z0 = 1.1 (+ 0.9, - 0.5) km at edge-on. This equivalent thickness includes several contributions and may be interpreted by the presence of a wide size-distribuion of ring particles up to diameters of a few kilometers. This ground-based thickness is probably larger than the actual local thickness and so does not contradict predictions. Author (ESA)

N85-26478 Massachusetts Univ., Amherst. Dept. of Physics and Astronomy.
AZIMUTHAL VARIATIONS IN SATURN'S A RING
Kari Lumme and William M. Irvine *In* CNES Planetary rings 1982 p 87-91 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

Observations defining the azimuthal brightness variations in Saturn ring A are reviewed. An explanation in terms of scattering by density wakes produced by large ring particles seems most reasonable. Author (ESA)

N85-26479* Massachusetts Univ., Amherst. Dept. of Physics and Astronomy.
A MODEL CONTAINING BLOBS FOR THE A RING OF SATURN
William Thompson, David vanBlerkom, and William M. Irvine *In* CNES Planetary Rings 1982 p 93-98 refs (For primary document see N85-26473 15-91)
(Grant NGL-22-010-023)
Avail: CEPADUES, Toulouse, France CSCL 03B

Observations of the brightness distribution of Saturn's ring A from four separate years, including azimuthal variations, are calibrated and interpreted through the use of a scattering model. In this model the A ring is composed of elongated density enhancements (blobs) embedded in a ring of uniform density. The blobs are approximated by biaxial ellipsoids. Intensity observations at one tilt angle can be used in the model to predict the intensity at other tilt angles. Analysis shows that there must be matter between blobs characterized by an optical thickness = 0.45 and single scattering albedo = 0.70. A rough estimate, based on what appears to be shadowing of one blob by another, gives the ring area occupied by blobs as 5%. Author (ESA)

N85-26480* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATURN'S E-RING IN THE RED SPECTRAL REGION
Walter A. Feibelman *In* CNES Planetary Rings 1982 p 99-102 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France CSCL 03B

Observations of the 1966 edge-on presentation of Saturn's E-ring in the red spectral region are presented. Techniques to suppress the glare from the planet are described. The E-ring profile does not exhibit a maximum near the orbit of Enceladus in 1966. Historical comments concerning the E-ring are included to illustrate that important planetary work can be done by ground-based observations. Author (ESA)

N85-26481 Lowell Observatory, Flagstaff, Ariz.
SATURN'S E RING
W. A. Baum, T. J. Kreidl, and L. H. Wasserman *In* CNES Planetary Rings 1982 p 103-109 refs Previously announced as N82-30202 (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The spatial distribution of material in Saturn's E ring was derived from ground-based CCD observations obtained during the 1980 edge-on presentation. The ring commences abruptly near 3 RS, peaks at the orbit or Enceladus (3.94 RS), and has tenuous outskirts to > 8 RS. The calculated attenuation factor = 5 x 10 to the minus 11th power/km in the equatorial plane near Enceladus, and the physical thickness of the ring there is 7500 km (FWHM). The attenuation factor in the equatorial plane is lower by a factor of 8 at Tethys, 76 at Dione, and 1000 at Rhea, while the physical thickness increases by factors of 1.7, 2.9, and 5.5, respectively. This distribution of ring material calls for interactions with charged particles and fields. If the E-ring particles are predominantly icy and small, the total mass of the ring is probably < 1 million tons. Author (ESA)

N85-26482* Arizona Univ., Tucson. Lunar and Planetary Lab.
SUMMARY OF OPTICAL GROUNDBASED E RING OBSERVATIONS AT THE UNIVERSITY OF ARIZONA
Stephen Larson *In* CNES Planetary Rings 1982 p 111-114 refs (For primary document see N85-26473 15-91)
(Grant NGL-03-002-002)
Avail: CEPADUES, Toulouse, France CSCL 03B

Photographic and CCD images of Saturn's E ring were obtained by a 154 cm telescope, edge-on and with the ring plane inclined at 5 and 10 deg. Radial structure and brightness; temporal brightness variations; and spectral reflectivity data are summarized. Author (ESA)

N85-26483 Observatoire du Pic-du-Midi, Bagneres de Bigorre (France).
PHOTOMETRIC STUDY OF THE SATURN E RING
Pierre Laques, Bruno Sicardy (Paris VII Univ.), Andre Brahic (Paris VII Univ.), and Jean Lecacheux (Observatoire de Paris-Meudon, France) *In* CNES Planetary Rings 1982 p 115-120 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

Electronographic observations of Saturn's E ring are discussed. The existence of a ring outside the classical Roche limit (defined for a liquid satellite) is illustrated. This ring has, in visible light, a brightness maximum approximately corresponding to the Enceladus orbit. It is observed until 6.3 Saturnian radii, but diffuse light from the full Moon prevented detection of faint material beyond this value. The brightness maximum near Enceladus strongly suggests exchange of material and interactions between rings and satellites. Satellites interact with rings not only dynamically, but also can be a source of faint material. Observation of such faint rings over a long time scale to see if their structure is stable or evolving is proposed. Author (ESA)

N85-26484 Observatoire de Paris-Meudon (France).
THE SATURN RING PARTICLES FROM OPTICAL REFLECTANCE POLARIMETRY
Audouin Dollfus *In* CNES Planetary Rings 1982 p 121-143 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The sunlight polarization characteristics of Saturn's A and B rings are summarized. For ring B, the polarization is the result of three combined effects: polarization by direct reflection of the sunlight on the ring particles; in visible light, this polarization is compatible with the model of dirty-ice blocks, but in UV the scattering is dominated by a population of micron size particles; polarization by light reflected by the rings from the Saturn globe; and a component with an azimuth always radial from the disk center and which varies with time, often significantly in a few days, in ways which are not predictable. An organized structure in or between the blocks marking the rings is needed and suggested explanations are discussed. For ring A, the component of polariza-

tion produced by direct reflection suggests ring particles of the same type as for the blocks in ring B. But very variable polarizations are observed, with azimuths often tilted locally for several tens of degrees from the scattering plane; clear relationships are not identified. Author (ESA)

N85-26485 Observatoire de Paris-Meudon (France).
SATURN RINGS: DIVISIONS, GAPS AND RINGLETS FROM GROUND-BASED TELESCOPES
Andouin Dollfus *In* CNES Planetary Rings 1982 p 147-151 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The Saturn rings were observed by 60 and 200 cm refractors with high angular resolution. Gaps and concentric bright or dark subrings are phase angle dependent; the steep luminance peaks of their light curves around zero phase angle are volume-density dependent (opposition effect). The overall result produces changes in the shapes and intensities of these features at small phase angles, which are analyzed. Author (ESA)

N85-26486* Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
THE RINGS OF URANUS
James L. Elliot *In* CNES Planetary Rings 1982 p 155-164 refs Sponsored by NASA and NSF (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France CSCL 03B

Stellar occultation data on the Uranian rings are summarized. Spatial resolution is 0.1 km, for positions of ring segments, 4 km for structural details. The system consists of 9 narrow rings with average geometric albedo of 0.02. The data are well fitted by a kinematic model that describes the rings as ellipses, inclined to the equatorial plane of Uranus and precess due to harmonic terms in the Uranian potential fields. The main characteristics of the Uranian ring system that need a confirmed theoretical explanation are: narrow rings; sharp edges; uniform orbital precession; origin of the eccentricities and inclinations; the structure of the epsilon ring; the structure of the eta ring; and the origin of the ring system. Author (ESA)

N85-26487* Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
INCLINATIONS OF THE URANIAN RINGS
Richard G. French and James L. Elliot *In* CNES Planetary Rings 1982 p 165-168 refs (For primary document see N85-26473 15-91)
(Grants NsG-7526; NSF AST-80-10699)
Avail: CEPADUES, Toulouse, France CSCL 03B

A kinematic model of the orbits of the Uranian rings was fitted to stellar occultation data. The results reveal that seven of the nine rings have significant inclinations with respect to the equatorial plane of Uranus. The inclinations are typically a few hundredths of a degree. Author (ESA)

N85-26488* Cornell Univ., Ithaca, N.Y. Dept. of Astronomy.
INFRARED OBSERVATIONS OF THE URANIAN RINGS
P. D. Nicholson, T. J. Jones (Mount Stromlo and Siding Spring Observatories, Canberra, Australia), and K. Matthews (California Inst. of Tech., Pasadena) *In* CNES Planetary Rings 1982 p 169-179 refs Sponsored by NASA, Mount Stromlo and Siding Spring Observatories, JPL, and NSF (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France CSCL 03B

Maps of the Uranian rings at 2.2 microns and spectrophotometric observations covering 2.0 to 2.4 and 2.9 to 3.9 microns are discussed. The maps reveal a 2:1 azimuthal brightness variation whose amplitude and phar are consistent with the width variation and apsidal precession of the epsilon ring. Comparison with models based on stellar occultation data leads to an upper limit of 0.01 on the normal optical depth of any broad (5000 km wide), diffuse component of the ring system. A significant east-west asymmetry, corresponding to a brightening of the near side of the rings relative to the far side, is unexplained. The spectrum of the rings is flat over the range 2.1 to 3.9 microns. There is no spectroscopic evidence for the presence of H2O. Author (ESA)

N85-26489 Paris VII Univ. (France).
STELLAR OCCULTATIONS BY URANUS RINGS ON 15 AUGUST 1980 AND 22 APRIL 1982 [LES OCCULTATIONS DU 15 AOUT 1980 ET DU 22 AVRIL 1982 PAR LES ANNEAUX D'URANUS]
Bruno Sicardy, Patrice Pouchet (Observatoire Europeen Austral, Chili), Christian Perrier (Observatoire Europeen Austral, Chili), Andre Brahic, Jean Lecacheux (Observatoire de Paris-Meudon, France), and Pierre Laques (Observatoire du Pic-du-Midi) *In* CNES Planetary Rings 1982 p 181-191 refs In FRENCH (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

Ground-based photometric stellar occultation data on Uranus rings at 2.2 and 0.89 microns (methane adsorption) wavelengths are described. Spatial resolution is 2 km. The data reveal the complex structure of the epsilon ring, the double structure of the alpha ring, the smooth profile of the beta ring, the large components of delta and eta rings, and the sharp edges of the gamma ring. An unexpected occultation was perhaps caused by a small satellite between the orbits of Miranda and Ariel. Author (ESA)

N85-26490 Indian Inst. of Astrophysics, Bangalore.
INDICATIONS OF TWIST IN THE EPSILON RINGS OF URANUS
R. Vasundhara and J. C. Bhattacharyya *In* CNES Planetary Rings 1982 p 193-195 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The possibility of the Uranus epsilon ring having a structure consisting of a twisted bundle of narrow lanes of condensed material similar to that of Saturn's F ring was examined by cross correlation of a pair of light curves for the same event from neighboring sections of the ring. The result supports the hypothesis. Author (ESA)

N85-26491 Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
RINGS AROUND NEPTUNE?
James L. Elliot *In* CNES Planetary Rings 1982 p 197-199 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

Two stellar occultations by Neptune were observed in a search for rings. None were found. Limits on the optical depth of 0.07 for equatorial rings with radii $>$ 31,400 km were placed by the observations. Similar stringent limits apply for nonequatorial rings. The sensitivity of the search was sufficient to detect a ring similar to any of the nine confirmed Uranian rings, but not the Jovian ring. Photometric data, however, suggest that a 29,800 to 36,000 km radius ring may exist. Author (ESA)

N85-26492 Cornell Univ., Ithaca, N.Y.
THE JOVIAN RING
Joseph A. Burns *In* CNES Planetary Rings 1982 p 203-209 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

A diaphanous ring having little substructure within its three components (main band, faint disk, and halo) lying in Jupiter's equatorial plane is discussed. Micron-sized grains account for much of the visible ring, but particles of centimeter sizes and larger must also be present to absorb charged particles. Since dynamical evolution times and survival life times are quite short ($<$ 100 to 1000 yr) for small grains, the jovian ring is being continually replenished; probably most of the visible ring is generated by micrometeoroids colliding into unseen parent bodies that reside in the main band. Author (ESA)

N85-26493* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PHYSICAL PROPERTIES OF SATURN'S RINGS
Jeffrey N. Cuzzi IN CNES Planetary Rings 1982 p 211-217 refs (For primary document see N85-26473 15-91)

Avail: CEPADUES, Toulouse, France CSCL 03B

Spaceborne astronomy data on Saturn's rings is summarized. The main rings are composed primarily of ice, possibly of low density and including small amounts of reddish material; particle radii are primarily centimeter-to-several meters, but significant amounts of micron-sized dust exists in certain regions including regions of resonance-induced collisions. The particle surface albedo and size distribution varies globally and locally. Evidence suggests several embedded moonlets of 10 km radius within Encke's division. The cause of the abrupt regional boundaries and associated differences in particle properties, especially the cause of the very abrupt and qualitatively similar inner A and B ring boundaries; the gap-ringlet structure and broad plateau features observed in the C and Cassini regions; the F and G rings (assuming that Enceladus is responsible for the E ring); and the cause of spokes and the SED are not understood. Author (ESA)

N85-26494 Colorado Univ., Boulder. Lab. for Atmospheric and Space Physics.

STRUCTURE AND DYNAMICS OF SATURN'S RINGS AS SEEN BY THE VOYAGER STELLAR OCCULTATION

L. W. Esposito *In* CNES Planetary Rings 1982 p 229-250 refs Sponsored by the Voyager Project (For primary document see N85-26473 15-91)

Avail: CEPADUES, Toulouse, France

The Voyager 2 photopolarimeter observed the occulation of delta Scorpii by Saturn's rings. Results show radial structure in the rings down to the resolution element of 100m. Density waves, embedded moonlets, and other proposed mechanisms are insufficient to explain the observed structure. A limit of < 100 density waves are likely to be found in the rings. Unresolved waves do not play a major role. A detailed search and histogram of optical depth in the outer B ring show no evidence of embedded moonlets. Ring mass is 5 (+ or - 3) times 10 to the minus 8th power of Saturn's mass. Power spectra of the rings show no dominant individual wavelengths: no preferred size for radical structure in the rings is seen. Comparison of Earth-based photometry and the viscosity and mass density of the rings inferred from density wave observations leads to a model of the rings that is many-particles thick. The vertical thickness of the rings is 50 m. Author (ESA)

N85-26495* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE C RING OF SATURN: A HIGH RESOLUTION VIEW OF SOME OF ITS STRUCTURE

Arthur L. Lane, Amara L. Graps (Colorado Univ., Boulder), and Karen E. Simmons *In* CNES Planetary Rings 1982 p 251-258 refs (For primary document see N85-26473 15-91)

Avail: CEPADUES, Toulouse, France CSCL 03B

Voyager 2 photopolarimeter stellar occultation data on Saturn C ring are discussed. The overall shape is much like the W-shape of other Saturnian rings and the Uranian epsilon ring. The inner structure is quite complex and it is not possible to locate the region of the weaker 1980S27 resonance. There appear to be pseudoperiodic structures, with very pronounced variations in optical depth. Possibly two isolated resonances in close proximity can develop a gravitational interaction that leads to wave patterns imposed upon the intervening ring material. The strength of the variations noted in optical depth between 90140 and 90175 km is too large to be an artifact. It could be temporal, however. Author (ESA)

N85-26496* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE ECCENTRIC RINGLET AT 1.29 R SUB S

C. Porco (California Inst. of Tech., Pasadena), N. Borderies (California Inst. of Tech., Pasadena), G. E. Danielson (California Inst. of Tech., Pasadena), P. Goldreich (California Inst. of Tech., Pasadena), J. B. Holberg (Arizonal Univ., Tucson), A. L. Lane, and P. D. Nicholson (Cornell Univ., Ithaca, N.Y.) *In* CNES Planetary Rings 1982 p 259-262 refs (For primary document see N85-26473 15-91)

Avail: CEPADUES, Toulouse, France CSCL 03B

Voyager 1 images, UV stellar occultation, and radio data on the eccentric ringlet in Saturn's C ring near the Titan 1:0 apsidal resonance are discussed. Kinematic analysis shows a ringlet precession rate equal to the mean motion of Titan and a width-radius relation expected for a ring maintaining itself against differential precession by self-gravity. The specific opacity estimated for this ringlet, 0.056 sqcm/gm, is comparable to that found for the eccentric ringlet at 1.45 Rs. Assuming that the eccentricity is completely forced by Titan, a more precise value can be determined for the location of the resonance than can be computed using the current values of Saturn's gravity coefficients. Author (ESA)

N85-26497* Arizona Univ., Tucson. Earth and Space Sciences Inst.

VOYAGER UVS OBSERVATIONS OF STELLAR OCCULTATIONS BY THE RINGS OF SATURN

J. B. Holberg and W. T. Forrester *In* CNES Planetary Rings 1982 p 265-277 refs (For primary document see N85-26473 15-91)

(Contract NAS7-100; Grant NAGw-62)

Avail: CEPADUES, Toulouse, France CSCL 03B

During the Voyager 1 and 2 Saturn encounters the ultraviolet spectrometers observed 3 separate stellar occultations by Saturn's rings. The observations, which sampled the optical depth of the rings at resolutions from 3 to 6 km, were used to establish a highly accurate distance scale allowing the identification of numerous ring features associated with resonances due to exterior satellites. Three separate observations of an eccentric ringlet near the location of the Titan apsidal resonance are discussed along with other ringlet-resonance associations occurring in the C ring. Density waves occurring in the A and B rings are reviewed and the analysis of one of these features is discussed. Author (ESA)

N85-26498 Observatoire de Paris-Meudon (France).

VOYAGER PLANETARY RADIO ASTRONOMY: GRAIN AND PARTICLE IMPACTS SHOT NOISE IN SATURN'S RING PLANE

M. G. Aubier, N. Meyer-Vernet, and B. M. Pedersen *In* CNES Planetary Rings 1982 p 289-297 refs (For primary document see N85-26473 15-91)

Avail: CEPADUES, Toulouse, France

Radio emissions were observed by Voyager 1 and Voyager 2 planetary radio astronomy experiments during Saturn ring plane crossings. Quasi-thermal noise is negligible. Shot noise due to electrons and ions collected and/or emitted by antennas and spacecraft can explain not too intense noise. However, for the strong noise in the ring plane, observed by Voyager 2 at 2.9 Rs, shot noise due to grain impacts must be considered. A quantitative evaluation of this process gives dust size = 1.1 microns close to the G ring. Author (ESA)

N85-26499 Radiophysics, Inc., Boulder, Colo.

SATURN ELECTROSTATIC DISCHARGES

J. W. Warwick, J. H. Romig, and D. R. Evans *In* CNES Planetary Rings 1982 p 299-306 refs (For primary document see N85-26473 15-91)

Avail: CEPADUES, Toulouse, France

Lighting-like bursts of ragged electrostatic noise, typically lasting for a few tens of milliseconds were detected by the Planetary Radio Astronomy instruments of Voyager 1 and 2 spacecraft near Saturn. The mean power emitted in an individual discharge is 1 million W. It is argued that the discharges occur outside the Saturn atmosphere, in the rings, and are associated with interaction between ice blocks in the rings and a small satellite, which form a capacitor. Author (ESA)

N85-26500 Observatoire de Paris-Meudon (France).

STATISTICAL STUDY OF SATURNIAN ELECTROSTATIC DISCHARGES OBSERVED BY THE VOYAGER PLANETARY RADIO ASTRONOMY EXPERIMENT

P. Zarka and B. M. Pedersen *In* CNES Planetary Rings 1982 p 307-317 refs (For primary document see N85-26473 15-91)

Avail: CEPADUES, Toulouse, France

During the Voyager-Saturn missions, the Planetary Radio

Astronomy experiment observed sporadic broadband (20 KHz to at least 40 MHz) emissions during a few days around the closest approaches. These emissions are interpreted as arising from short-lived electrostatic discharges in the vicinity of Saturn. Their characteristics were studied for the experiment's high band (> 1.2 MHz). A difference between the periodicity of the Saturn electrostatic discharges is found, when comparing Voyager 1 and 2 observations. Author (ESA)

N85-26501 Observatoire de Paris-Meudon (France).
AN EARTH-BASED ATTEMPT TO DETECT SATURN ELECTROSTATIC DISCHARGE (SED) AT 21 CENTIMETERS
A. Lecacheux and F. Biraud *In* CNES Planetary Rings 1982 p 319-324 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

An unsuccessful attempt was made to observe Saturn electrostatic discharges (1420 MHz) using a ground-based radio telescope operating at 21 cm. Results suggest, however, that the maximum flux density of the discharge radio emission is of the order of > 100 Jy at the Earth, in the decameter wavelength. Author (ESA)

N85-26502 California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.
SOLVED UND UNSOLVED PROBLEMS IN PLANETARY RING DYNAMICS
N. Borderies, P. Goldreich, and S. Tremaine (Massachusetts Inst. of Tech., Cambridge) *In* CNES Planetary Rings 1982 p 327-329 (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

Saturn ring dynamics are discussed. Mechanical properties of the particles; particle size; velocity dispersion; large scale structure; and linear and nonlinear density waves are considered.
Author (ESA)

N85-26503 Planetary Science Inst., Tucson, Ariz.
HOW A SHEPHERD GUIDES A SHEEP HERD
Richard Greenberg *In* CNES Planetary Rings 1982 p 331-337 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The mechanism by which a shepherd satellite exerts a confining torque on a planetary ring is considered from the point of view of a single ring particle. It is not clear how to most meaningfully include damping effects and other collisional processes into this type of approach to the problem. Two-body theories and harmonic oscillations about circular motion are discussed. Author (ESA)

N85-26504 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
RESONANCE IDENTIFICATIONS IN SATURN'S RINGS
W. E. Wiesel and F. A. Franklin (Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.) *In* CNES Planetary Rings 1982 p 349-359 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The resonance band structure formed when Saturn's oblateness perturbations are included in a single classical resonance is introduced. Expressions for resonance location, libration region width, and the maximum librator range are applied to areas of the C and B rings, the Cassini division, and the F ring. Possible mechanisms involved are discussed. Author (ESA)

N85-26505 Paris VII Univ. (France).
EVOLUTION OF COLLISIONAL SYSTEMS
Andre Brahic *In* CNES Planetary Rings 1982 p 361-362 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The dynamical evolution of planetary disks in the gravitational field of an oblate planet and a satellite was numerically simulated. Each particle precesses around the equatorial plane of an oblate planet at a rate depending on its distance to the planet. Thus, an initially flat ring, with a mean plane different from the planet's equatorial plane, is rapidly thickened on a time scale of the order of few collisions per particle. Then, the ring mean plane gradually swings towards the planet equatorial plane on a time scale inversely proportional to the usual second gravitational harmonic coefficient of the planet. Author (ESA)

N85-26506 Observatoire du Mont-Gros, Nice (France).
A SIMPLE MODEL OF SATURN'S RINGS REVISITED
M. Henon *In* CNES Planetary Rings 1982 p 363-384 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

A crude model of the Saturn rings based on a power-law distribution for particle size is described. The parameters of the model are determined from apparent thickness and radar-radio observations. Mass of the rings, mean surface density, size of largest particle, time scale for dynamical evolution, minimal size of gap-forming particles, number and size distribution of the gaps, and kinematic viscosity are derived. Comparisons with observations and with numbers derived in other ways meet with mixed success. The most serious problem lies in the derived time scale for the radial spreading of the disk, which is < 10 million years.
Author (ESA)

N85-26507* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
VISCOSITY IN SATURN'S RINGS
Jack J. Lissauer (California Univ., Berkeley), Frank H. Shu (California Univ., Berkeley), and Jeffrey N. Cuzzi *In* CNES Planetary Rings 1982 p 385-392 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France CSCL 03B

The technique of estimating the viscosity in Saturn's rings from the damping rate of waves observed to be propagating within the rings is discussed. The wavetrains of attempts using spiral density waves as a diagnostic suffer significant complications that compromise the interpretations. A method that considers the damping of spiral bending waves was used to deduce a kinematic viscosity of 260 (+150, -100) sqcm/sec for the middle of the A ring where bending waves are excited by the 5:3 vertical resonance with Mimas. This value implies upper limits on the particle velocity dispersion and local ring thickness of 0.4 cm/sec and 30 m, respectively. Author (ESA)

N85-26508 Observatoire de Besancon (France).
SIZE DISTRIBUTION IN COLLISIONAL SYSTEMS
S. Clairemidi *In* CNES Planetary Rings 1982 p 397-402 ref In ENGLISH; FRENCH summary (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The dynamical evolution of a three dimensional system of particles of different masses and sizes, orbiting in the gravitational field of a central body, and interacting through inelastic collisions is studied to simulate interparticle collisions, particle size distribution, and self attraction of the particles in planetary rings. Results show that the velocity distributions of the different populations of particles quickly reach an equilibrium dominated by the mean velocity of the massive particles. There is no real equipartition of energy but rather a kind of separation. The more elastic the collisions, the bigger the separation. The larger the mass ratio, the bigger the separation. Massive particles evolve faster than the lightest ones. The spins of the particles reach an equilibrium state and a small excess of prograde rotations is noted. The smallest particles rotate faster than the other ones. Author (ESA)

N85-26509 Planetary Science Inst., Tucson, Ariz.
PHYSICAL AND GEOLOGICAL NATURE OF SATURN'S LARGER RING PARTICLES
Clark R. Chapman, Richard Greenberg, Stuart Weidenschilling, and Donald R. Davis *In* CNES Planetary Rings 1982 p 403-406 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The way in which an important mass fraction of the Saturn rings may reside in particles with dimensions of tens of meters to kilometers, which are too few to be seen by radio occultation and too small to be detected in Voyager pictures is described. The physical and geological structure of such bodies and how they

influence interactions among ring particles are considered.
Author (ESA)

N85-26510* Planetary Science Inst., Tucson, Ariz.
COMMENTS ON COLLISION MECHANICS IN RING SYSTEMS
William K. Hartmann *In* CNES Planetary Rings 1982 p 407-422 refs (For primary document see N85-26473 15-91)
(Contract NASw-2909)
(PSI-Contrib-186) Avail: CEPADUES, Toulouse, France CSCL 03B

Collisions within planetary ring systems, especially Saturn's, are discussed. The particles may have coherent icy cores and less coherent granular or frosty surface layers, consistent with thermal eclipse observations. Collisions do not cause catastrophic fragmentation of the particles, although minor surface erosion and reaccretion is possible. Evolution by collisional fragmentation is thus not as important as in the asteroid belt. Models suggest that the fractional number of projectile masses dislodged when solid (or solid-core) projectiles strike solid ice or granular surface layers does not exceed the order of 10 to the minus 7th to minus 9th power. Even at this rate, the half life of ring particles would be less than the age of the solar system in crowded ring regions unless there was very efficient reaccretion. A plausible ring particle model involves solid ice cores with granular surface layers that exchange material by slow erosion and efficient reaccretion; the granular layers protect the cores from rapid erosion. Author (ESA)

N85-26511 Cornell Univ., Ithaca, N.Y.
EFFECTS OF SHEPHERD CONJUNCTIONS ON SATURN'S F-RING
M. R. Showalter *In* CNES Planetary Rings 1982 p 423-429 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

Perturbing effects of conjunctions of shepherd satellites and Saturn F ring braids are examined. It is argued that the dynamical effects of satellite conjunctions on the F-ring are too small to account for features as substantial as the braids, and that there is nothing special about satellite conjunctions. Since observations of the F-ring braids are so few in number, it seems plausible that the observed association is simply a coincidence. Author (ESA)

N85-26512* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ON THE RADIAL STRUCTURE OF PLANETARY RINGS
A. W. Harris and W. R. Ward *In* CNES Planetary Rings 1982 p 431-437 refs (For primary document see N85-26473 15-91)
(Contract NAS7-100)
Avail: CEPADUES, Toulouse, France CSCL 03B

Viscous shear stress of a ring of particles in orbit about a planet due to the radial gradient of orbital velocity is discussed. This stress tends to spread the ring with time. At low optical depth (t) and at high t, the shear stress is an increasing function of t. In the intermediate range stress may decrease with increasing t, leading to a diffusive instability which tends to break an initially uniform ring into ringlets of high and low optical depths. According to the shepherd satellite model of narrow ring confinement, the viscous shear stress is opposed by tidal torques from neighboring shepherds, so that radial spreading does not occur. By requiring that the gradient of the viscous shear stress (i.e., angular momentum deposited) be equal to the shepherd satellite torque density at all radii in the rings, equilibrium radial density profiles of a confined ring were constructed. The most noteworthy feature of these profiles is a narrow, high density ringlet surrounded by a low optical density halo of greater width. Author (ESA)

N85-26513* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DIFFUSION INSTABILITY IN A BIMODAL DISC
W. R. Ward and A. W. Harris *In* CNES Planetary Rings 1982 p 439-445 Sponsored by NASA (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France CSCL 03B

A simplified model of radial diffusion in a planetary disk with a bimodal size distribution is presented. The large particle component excites the small particles' dispersion velocity via gravitational scattering. The resulting small particle viscous stress goes through a maximum near optical depth = sq root 3. Such a stress profile promotes the development of high and low optical depth zones. The resulting ringlet appearance is due primarily to the distribution of small particles, which produce most of the optical depth but may constitute only a minor portion of system mass. Author (ESA)

N85-26514* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE GRAVITATIONAL INTERACTION BETWEEN INCLINED, ELLIPTICAL RINGS
C. F. Yoder *In* CNES Planetary Rings 1982 p 447-455 refs (For primary document see N85-26473 15-91)
(Contract NAS7-100)
Avail: CEPADUES, Toulouse, France CSCL 03B

An expression for the potential for two elliptical, inclined rings is derived from a model in which the gravitational torque between two wide rings or within a ring of finite width can prevent differential precession caused by planetary oblateness. The model was proposed to explain the observed eccentricity and width variations of the Uranian epsilon ring. The stationary solutions and stability of this system are examined. Author (ESA)

N85-26515* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ORBITAL ELEMENTS OF SATURN'S F RING AND ITS SHEPHERDING SATELLITES
S. P. Synnott *In* CNES Planetary Rings 1982 p 459-460 ref (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France CSCL 03B

The orbital parameters of Saturn's F-ring and the shepherding satellites were estimated from Voyager images. The method, results and associated uncertainties are described. Braids were observed in a few frames near shepherd satellite conjunctions.Author (ESA)

N85-26516 Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
STOCHASTIC MODELING OF PLANETARY RING SYSTEMS
Robert W. Hart *In* CNES Planetary Rings 1982 p 461-469 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

Maximum entropy configurations are calculated for three idealized, collisionless, planar ring systems of circular Keplerian orbits. For identical point particles, the radial depedence of number density applies to systems of arbitrary packing density. For particles of various masses, a mass separator effect is found, with the most massive particles tending to populate the densest portion of the ring system. The analysis also provides a particle size distribution having an exponential mass cutoff, with the cutoff depending on radial distance from the densest portion of the rings. Thus, the model displays gross similarities with real ring systems and suggests that further insight could be gained by generalizing the approach to address elliptical and out-of-plane orbits, and dense systems having distributions of particle sizes. Author (ESA)

N85-26517 Rice Univ., Houston, Tex.
DENSE BUT COLLISIONLESS ORBITING RINGS
F. C. Michel *In* CNES Planetary Rings 1982 p 471-478 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The discovery by Voyager that the rings of Saturn are substructured into a multitude of narrow ringlets is discussed. The rings have substantial optical depths, implying high collision rates and therefore rapid diffusive spreading, which would lead to the ringlet structure being eradicated. Suggestions that this substructure is either dynamically maintained by many small perturbing subsatellites or is actually a spiral pattern of density waves are considered. Voyager 2 was unable to detect such subsatellites, and many of the broader isolated ringlets are clearly closed rings, rather than segments of a spiral. It is proposed that convective motion, a helical rolling motion of a ringlet as it orbits, provides a stabilizing

influence. For ringlets of negligible mass orbiting a point mass, the ringlets can be arbitrarily dense without collisions acting to dissipate them. For an oblate planet and finite ring mass, a small but finite collision rate (or other compensating perturbations) are required. Convective motions then serve to vastly reduce the effective viscosity within a ringlet and greatly increase its evolutionary lifetime. Author (ESA)

N85-26518 Norwegian Defence Research Establishment, Kjeller.
APPLICATIONS OF THREE-BODY RESONANCES TO SATELLITES AND PLANETARY RINGS
Kaare Aksnes *In* CNES Planetary Rings 1982 p 479-487 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

Formulas for the strengths and libration/circulation characteristics of resonances for which qn1 - (p+q) n2 + pn3 = 0, where p and q are integers and n1, n2, and n3 are the mean motions of any three gravitationally interacting bodies in coplanar orbits were derived. The formulas are applied to Laplacian satellite resonances and to other possible three-body resonances in the satellite and ring systems of Jupiter, Uranus, and Saturn. Author (ESA)

N85-26519 Facultes Univ. Notre-Dame de la Paix, Namur (Belgium).
THE ADIABATIC INVARIANT: A TOOL FOR THE STUDY OF THE DYNAMICS OF THE SOLAR SYSTEM
J. Henrard *In* CNES Planetary Rings 1982 p 489-497 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

Results of the theory of the adiabatic invariant are applied to a simple one degree of freedom Hamiltonian system, the model used for resonance problems in celestial mechanics. The capture into resonance of the pair of satellites Enceladus-Dione is analyzed. Author (ESA)

N85-26520 Academy of Sciences (USSR), Moscow.
INSTABILITIES AND THE FINE STRUCTURE OF SATURN'S RINGS
M. S. Bobrov, A. M. Fridman, and V. L. Polyachenko *In* CNES Planetary Rings 1982 p 499-510 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The effects of resonances, kinematic instability due to differentiality of angular velocity and to inverse dependence of kinematic viscosity on the particle density; and collective processes due to selfgravitation of the medium on Saturn rings are discussed. It is argued that a disk of homogeneous density and optical depth $> >1$ divides into separate ringlets which are so narrow that their widths are less than or comparable with instrument resolution (the highest resolution, = 150 m, obtained in photopolarimetry measurements is not less than the thickness usually assumed). The nonlinear stage of the instability can lead to appearance of clear spaces between separate ringlets. Author (ESA)

N85-26521 Centre d'Etudes et de Recherches Geodynamiques et Astronomiques, Grasse (France).
DYNAMICS OF NEUTRAL SMALL PARTICLES
F. Mignard *In* CNES Planetary Rings 1982 p 513-534 refs In FRENCH (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The dynamics of small grains when radiation pressure forces are added to gravitational attraction are reviewed. Mie scattering is used to compute momentum transfer between a grain and the radiation field. Results give the value of the ratio of radiation pressure force to gravitational force for various materials. The motion of a grain in heliocentric orbit, including conditions for a particle to be ejected from the solar system, abrupt change of the orbital elements due to fragmentation along with continuous variation generated by sublimation and sputtering, is discussed. Poynting-Robertson drag is considered and results concerning the lagrangian points L4 and L5 are given. Orbital evolution of a grain for a spherical planet is presented. In order to make the solution relevant for planetary rings it is adapted to allow for the planet's oblateness. Author (ESA)

N85-26522 Max-Planck-Inst. fuer Kernphysik, Heidelberg (West Germany).
DYNAMICS OF CHARGED SMALL PARTICLES
E. Gruen *In* CNES Planetary Rings 1982 p 535-540 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The charging of dust grains in the Jupiter and Saturn magnetospheric plasmas and the resulting dynamic effects are discussed. Collisions of dust particles with magnetospheric electrons cause dust particles to become negatively charged if the electron flux exceeds the photoelectron flux at a given distance from the Sun. The charged dust particles interact with a planetary magnetic field via the Lorentz force. Only for very small particles the Lorentz force exceeds the gravitational force of the planet. In most observationally relevant cases (Jupiter's and Saturn's ring systems) electromagnetic forces cause only small perturbations of the Keplerian orbits. Local fluctuations of the plasma parameters change the charge of the particles and lead to spatial diffusion. Small changes in the plasma environment of a ring of particulates may release large quantities of dust grains by electrostatic blow-off. Drag forces induced by the magnetospheric plasma compete with the radiation pressure drag outside the synchronous orbit.
Author (ESA)

N85-26523 Laboratoire d'Astronomie Spatiale, Marseille (France).
DIFFUSION OF DUST AROUND A CENTRAL BODY
P. Barge, J. M. Millet, and R. Pellat (Ecole Polytechnique, Palaiseau, France) *In* CNES Planetary Rings 1982 p 541-548 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The formalism of the quasi-linear theory is applied to the diffusion of Keplerian orbits by a random force; the classical Fokker-Planck equation is reduced to a simple diffusion equation in the space of the invariants of the unperturbed motion. The method avoids the second order calculations necessary to obtain the friction terms and makes the diffusion coefficients easier to compute. This formalism allows study of diffusion by a stochastic force in many astrophysical situations. Results show that diffusion only occurs if the spectrum of the fluctuations encloses modes resonant with the harmonics of the orbital frequency. Thus, to be efficient, the fluctuations have to be produced by processes on the scale of orbital motions. Around a planet, in a rotating disk of individual particles, a random force might be assumed to give a resonant diffusion, piercing gaps through the disk. Author (ESA)

N85-26524 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
THE FORMATION OF SPOKES IN SATURN'S RINGS
G. E. Morfill *In* CNES Planetary Rings 1982 p 551-568 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

Assuming that electromagnetic interactions are related to the formation of Saturn ring spokes, it is shown that energy constraints and spoke observations suggest an evolutionary spoke formation model rather than a sudden imprint of an unspecified phenomenon. It is shown that relatively small (100's km) plasma clouds, interacting with the magnetosphere and with small dust particles from the ring can obtain high radial velocities. The dynamo which drives the plasma cloud is a direct result of the difference in the azimuthal velocity components of the corotating plasma and the Keplerian (charged) dust, with its associated azimuthal current. In its wake, the plasma cloud leaves an almost radial trace of submicron sized dust elevated above (or below) the ring plane. The role of meteorite impacts, electric discharges in the ring, and particle acceleration along parallel electric fields in the origin of plasma clouds is discussed. Author (ESA)

N85-26525 Manchester Univ. (England). Dept. of Astronomy.
ON THE ROLE OF MOTHER-PLANET MAGNETIC FIELD IN SPIRAL STRUCTURE EXPLANATION OF FORMATION OF

SPOKES

G. X. Song (Academia Sinica, Shanghai) *In* CNES Planetary Rings 1982 p 569-574 refs (For primary document see N85-26473 15-91)

Avail: CEPADUES, Toulouse, France

Saturn B ring spoke features are explained in terms of the electromagnetic effect. Due to the existence of the magnetic field in Saturn, plasma, and microsized dust particles, the loosely spiral structure of magnetic field near Saturn (which is similar to that invoked to explain the sectoral structure of the interplanetary magnetic field in the solar system) may be induced. The spiral structure is rotating with mother-planet and will gradually form a corotation circle, but the wave amplitude will grow outside the corotation and will decay gradually inside the corotation. Using the characteristics of this spiral structure, the mechanism of spoke formation is analyzed. Author (ESA)

N85-26526 Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (West Germany).

ON PLANETARY RINGS AS SOURCES AND SINKS OF MAGNETOSPHERIC PLASMAS

W.-H. Ip *In* CNES Planetary Rings 1982 p 575-596 refs (For primary document see N85-26473 15-91)

Avail: CEPADUES, Toulouse, France

The effects of the presence of satellite and ring systems in the magnetospheres of Jupiter, Saturn and Uranus on the general dynamics and compositions of the magnetospheres are discussed. Besides acting as a sink for the magnetospheric particles via solid-body absorption, the satellites and rings could also emit neutral and ionized gas into the magnetospheres. In the case of the Saturnian rings, because of their especially broad structure and close proximity to the planet, strong exospheric and ionospheric couplings can also take place. Several observed features (e.g., depletion of the ionospheric electron content, generation of the atomic hydrogen cloud in the vicinity of the rings, and a discontinuity in optical depth at 1.64 Rs in the B ring) of the ionosphere and the ring system could result from the related processes of mass transport and exchange between the ionosphere and the rings. Similar effects may also occur in the region of the tenuous E ring leading to peculiar equatorial confinement of the corotating thermal plasma there. Author (ESA)

N85-26527* Texas Univ., Austin. Dept. of Astronomy and Physics.

THE E-RING OF SATURN

R. Smoluchowski *In* CNES Planetary Rings 1982 p 603-606 refs (For primary document see N85-26473 15-91)

(Grant NsG-7505)

Avail: CEPADUES, Toulouse, France CSCL 03B

The origin of the E-ring of Saturn and its relationship to Enceladus is discussed. It is proposed that the ring is formed as a consequence of micrometeoritic and meteoritic bombardment of Enceladus. It is shown that the mass reaching the ring replaces that lost by erosion, drag and other mechanisms. The effect of the presence of amorphous ice and the possible opposition effect is indicated. Author (ESA)

N85-26528* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

MACROSTRUCTURE AND MICROPHYSICS OF SATURN'S E-RING

Kevin D. Pang, Charles C. Voge, and Jack W. Rhoads *In* CNES Planetary Rings 1982 p 607-613 refs Sponsored by NASA (For primary document see N85-26473 15-91)

Avail: CEPADUES, Toulouse, France CSCL 03B

Observed optical and infrared properties of Saturn's E-ring are explained in terms of Mie scattering by a narrow distribution of ice spheres with an effective diameter of 2 to 2.5 microns, and an effective variance of 0.1 to 0.15. The spherical shape of the ring particles and their narrow size distribution imply that they had a molten origin, followed by quick freezing. Continued replenishment of the E-ring by volcanic eruptions on Enceladus seems plausible. The vertical structure of the E-ring consists of many layers. The stratification of the particles may be due to electrostatic levitation, similar to that experienced by particles in the spokes.

Author (ESA)

N85-26529 Observatoire de Paris-Meudon (France).

MULTIVALUED ELECTROSTATIC POTENTIALS; CHANCE OR NECESSITY FOR THE CHARGE OF SOLID PARTICLES NEAR SATURN?

N. Meyer-Vernet *In* CNES Planetary Rings 1982 p 615-625 refs (For primary document see N85-26473 15-91)

Avail: CEPADUES, Toulouse, France

The response of the electrostatic charge on a solid particle to a slight variation of ambient parameters near Saturn (flux of suprathermal electrons; passage from shadow to sunlight) is examined. Results are often opposite to those given by rules of thumb, or careless numerical calculations. The potential can have two stable equilibrium states in a given environment: the sign of the charge depends on minor historical accidents of the system, and small environmental perturbations yield important jumps of charge. The importance of the process is evaluated for different saturnian environments. Consequences for grain physics (dynamics in electromagnetic fields, agglutination and disruption) are discussed. Author (ESA)

N85-26530 Observatoire de Paris-Meudon (France). Dept. de Recherches Spatiales.

ON THE ELECTRIC CHARGE CARRIED BY DUST GRAIN EXCITATION OF VIOLENT DISCHARGE

Jean-Pierre J. Lafon and Jean M. Millet (Laboratoire d'Astronomie Spatiale, Marseille, France) *In* CNES Planetary Rings 1982 p 627-630 refs (For primary document see N85-26473 15-91)

Avail: CEPADUES, Toulouse, France

It is shown that the local increase of the electric field resulting from field emission, even if relatively weak and occurring during a time in which the usual charging processes are unable to change the charge carried, can destabilize the equilibrium and produce violent charged particle emission in current beams. Such processes can release a large amount of energy in a short time. They can prevent solid body disruption by excessive fields. They can also strongly perturb their trajectories so far as these depend on electromagnetic forces. The mechanism can be excited at the same time for a large number of charged bodies in large spatial zones by collective processes. Dynamical concentration of (sub) micron size grains increasing their space number density and subsequently decreasing the mean interparticular distance while increasing the collision or encounter rates is discussed.

Author (ESA)

N85-26531* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE GRAVITO-ELECTRODYNAMICS OF CHARGED DUST IN PLANETARY RING SYSTEMS

D. A. Mendis (California Univ., San Diego, La Jolla), J. R. Hill (California Univ., San Diego, La Jolla), and T. G. Northrop *In* CNES Planetary Rings 1982 p 631-643 refs (For primary document see N85-26473 15-91)

(Grants NsG-7102; NGR-05-009-110; NsG-7623; NSF AST-81-87-6)

Avail: CEPADUES, Toulouse, France CSCL 03B

The dynamics of micron and submicron sized dust grains moving under the combined influence of planetary gravitation and the electromagnetic forces within the corotating regions of planetary magnetospheres are discussed. Magnetogravitational capture of charged grains in planetary rings is outlined. The adiabatic motion of charged dust is reviewed. Author (ESA)

N85-26532 Academy of Sciences (USSR), Moscow. Inst. of Physics of the Earth.

FORMATION OF THE SOLAR SYSTEM

V. S. Safronov *In* CNES Planetary Rings 1982 p 647-659 refs (For primary document see N85-26473 15-91)

Avail: CEPADUES, Toulouse, France

Evolution of the solar nebula and formation of the pro-

toplanetary cloud is outlined. Evolution of the protoplanetary cloud and formation of the swarm of smaller bodies is discussed. Evolution of the preplanetary bodies and accumulation of the planets is summarized. Author (ESA)

N85-26533 Cambridge Univ. (England). Inst. of Astronomy.
THE FORMATION OF THE TERRESTRIAL PLANETS FROM LUNAR SIZED PLANETESIMALS
Sverre J. Aarseth and Myron Lecar (Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.) *In* CNES Planetary Rings 1982 p 661-674 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

Numerical simulation of the formation of the terrestrial planets from lunar sized planetesimals is described. The simulation was confined to a plane and included the gravitational forces between planetesimals as well as the Sun. When two planetesimals physically collided, they were merged into one. Initially, 200 moons were distributed with uniform surface density, from 0.5 to 1.5 AU. The eccentricities were zero at the start: the average eccentricity grew to 0.06 in 10,000 yr. After 65,000 yr, 5 bodies are left, the 2 largest of which each has 3/4 of an Earth mass. This system is extremely stable to further evolution and an additional mechanism may be required to reduce the number of bodies to one or two. Author (ESA)

N85-26534 Ecole Polytechnique, Palaiseau (France). Centre de Physique Theorique.
STATISTICAL THEORY OF PLANET GROWTH
P. Hornung and R. Pellat *In* CNES Planetary Rings 1982 p 677-685 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The main average parameters necessary for understanding planet growth are computed. The analysis takes into account simultaneously the inelastic hard sphere collisions (including gravitational focusing) and the long distance self gravitational interaction between the planetesimals orbiting around the Sun. Author (ESA)

N85-26535 Pisa Univ. (Italy). Dipt. di Matematica.
TIDAL BREAKUP AND ORIGIN OF THE URANIAN RING SYSTEM
P. Farinella, A. Milani, A. M. Nobili, and P. Paolicchi (Observatorio Astronomico di Brera, Como, Italy) *In* CNES Planetary Rings 1982 p 687-689 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

It is shown that a configuration of alternating rings and moonlets could be the natural outcome of an evolutionary history of Uranus starting from a simple initial condition. In the evolution of the system, the ring material was confined in very narrow zones due to the shepherding mechanism. The tidally-evolving shepherding moonlets were captured into stable resonance configurations with the outer Uranian satellites. This scenario is not consistent with the hypothesis that the ring system is a young and short-lived phenomemon, since its evolution was governed by tidal orbital decays which require long timescales. The system around Uranus could be the typical end-product of tidal evolution and breakup of a satellite which occurred many times in the history of the solar system and will occur again to objects like Phobos and Triton. Author (ESA)

N85-26536* Cornell Univ., Ithaca, N.Y. Lab. for Planetary Studies.
THE ASTEROID RING
S. F. Dermott and C. D. Murray *In* CNES Planetary Rings 1982 p 695-701 refs (For primary document see N85-26473 15-91) (Grants NGR-33-010-220; NSF AST-80-24042)
Avail: CEPADUES, Toulouse, France CSCL 03B

From a statistical analysis of asteroid orbital period data, it is shown that the present distribution of asteroids is strongly correlated with the present orbital period of Jupiter (to 1 part in 5000). By analyzing the distribution of orbital eccentricities and inclinations it is shown that the resonant structure of the belt was formed after the asteroids dispersed from the near-coplanar disk in which they accreted. Author (ESA)

N85-26537* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ASTEROID COMPOSITIONAL RINGS: CLUES TO THE COMPOSITIONS OF PRIMORDIAL PLANETESIMALS IN THE MIDDLE SOLAR SYSTEM
E. F. Tedesco *In* CNES Planetary Rings 1982 p 703-712 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France CSCL 03B

The distribution of asteroid taxonomic types at distances between 2.1 and 5.3 AU is discussed. There are four major, overlapping but compositionally distinct rings of asteroids present within this range of heliocentric distance. The rings, within which 80% of each of 4 major taxonomic types (S, C, P, and D) fall, are centered at 2.6 (0.7), 2.9 (0.8), 3.4 (0.7), and 4.6 (1.5) AU respectively, where the numbers in parentheses are the ring widths in AU. The overall physical resemblence between the asteroid rings and planetary rings is poor; physically the asteroid belt more closely resembles a debris strewn satellite system. Once the mineralogy of these taxonomic types is established, and complications arising from postaccretionary metamorphism are dealt with, they may be used as probes of physical conditions in the early solar system. The identification of primordial planetesimals can be used in studying the siblings of the planetesimals responsible for the final stage of planetary accretion. Author (ESA)

N85-26538 Scuola Normale Superiore, Pisa (Italy).
COLLISIONAL OUTCOMES IN THE ASTEROID BELT
P. Farinella, P. Paolicchi (Osservatorio Astronomico di Brera, Como, Italy), and V. Zappala (Osservatorio Astronomico di Tornio, Italy) *In* CNES Planetary Rings 1982 p 713-715 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

In order to study the outcomes of the major collisions endured by asteroids of different sizes, the projectile's kinetic energy (PKE) is compared with the energy needed to overcome the target's solid-state cohesion (expressed as SM, where M is target mass and the critical specific energy S ranges from 100,000 to 100 million erg/g, depending on the material properties) plus the target's self-gravitational energy. This latter is multiplied by a factor gamma, to account for energy losses due to dissipative processes. It is predicted that catastrophic fragmentation occurs and that a substantial part of the target's mass is dispersed to infinity when PKE $>$ SM $+$ (3 gamma/5) (GMsq/R) where R is target radius. It is concluded that almost all asteroids are outcomes of catastrophic collisions, that caused either complete fragmentation of the target objects or, at least, drastic readjustments of their internal structure, shape and spin rate. Author (ESA)

N85-26539 London Univ. (England). Dept. of Applied Mathematics.
THE EVOLUTION OF METEOR STREAMS
Ken Fox and Iwan P. Williams *In* CNES Planetary Rings 1982 p 717-721 refs (For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The use of data on meteor streams to test theories of planetary ring evolution is suggested. The phenomena are similar in that a ring system can be considered as a family of particles moving in coherent orbits, susceptible to gravitational influence. Observational data on meteor streams are available for at least 100 yr in all cases, and $>$ 1000 yr for the Perseids, Eta Aquarids, and Orionids. The easiest orbital parameter to measure is the longitude of the ascending (descending) node, omega, as this is clearly given by the position of the Earth when the stream hits the atmosphere and becomes visible. Orbital data and the mean value of c/omega/dt for the major meteor streams are given. The cross section of the Geminid stream (the closest approximation to a planetary ring) as seen from the Earth at 2 epochs separated by 500 yr is shown. Author (ESA)

N85-26540 Arizona Univ., Tucson. Dept. of Planetary Sciences.
FUTURE OBSERVATIONS OF PLANETARY RINGS FROM GROUND-BASED OBSERVATORIES AND EARTH-ORBITING SATELLITES
Bradford A. Smith *In* CNES Planetary Rings 1982 p 725-729
(For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

The use of ground-based stellar occultations and the Space Telescope to study planetary rings is discussed. The Space Telescope matches the resolution attained by the Voyager cameras 10 days before Saturn encounter, and can record spokes, eccentric ringlets, narrow gaps, etc. It could test the hypothesis that Saturn's ring spokes originate as plasma clouds that begin to grow radially shortly after formation. The rings of Jupiter and seven of the narrow rings of Uranus are resolvable with this instrument. Dynamical studies will be aided by astrometric tracking of shepherding satellites and possible imbedded moonlets. The High Speed Photometer can record stellar occultations by planetary rings with time resolution as high as 10 microsec. Spacelab, Magellan, and Solstice spacecraft can search for ring atmospheres, and infrared spaceborne telescopes can study ring particle composition and thermal properties. Author (ESA)

N85-26541* California Inst. of Tech., Pasadena.
FUTURE STUDIES OF PLANETARY RINGS BY SPACEPROBES
E. C. Stone *In* CNES Planetary Rings 1982 p 731-735 ref
(For primary document see N85-26473 15-91)
(Contract NAS7-100)
Avail: CEPADUES, Toulouse, France CSCL 03B

The Voyager 2 encounter with Uranus and Neptune, and Galileo with Jupiter are described. The opportunities and capabilities for ring studies are discussed. At Uranus, stellar occultation, radio occultation, solar occultation, and imaging studies are possible. At Neptune, only stellar occultations and imaging seem promising. The Galileo ultraviolet spectrometer and dust collector offer interesting possibilities for ring studies. Author (ESA)

N85-26542 Paris VII Univ. (France).
A PRIORITY OF SPACE EXPLORATION: OBSERVATION OF SATURN'S RINGS FROM A SATURN ORBITER
Andre Brahic *In* CNES Planetary Rings 1982 p 739-742 refs
(For primary document see N85-26473 15-91)
Avail: CEPADUES, Toulouse, France

A Saturn orbiter to follow up observations of Saturn's ring by Voyager spacecraft is suggested. Significant improvements in knowledge about the ring system could be obtained with the highest possible resolution, with observations with a large variety of phase angles, with multiple occultation experiments, with observations of the evolution of selected area with time, and with observations of small-particle phenomena and electromagnetic properties of the spokes. Author (ESA)

N85-26543* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RENDEZVOUS WITH SATURN'S RINGS
Kerry T. Nock *In* CNES Planetary Rings 1982 p 743-759 refs
(For primary document see N85-26473 15-91)
(Contract NAS7-100)
Avail: CEPADUES, Toulouse, France CSCL 03B

The science rationale and instrumentation and engineering feasibility and design of a mission to rendezvous with the rings of Saturn are studied. In situ exploration of the rings requires spacecraft systems with enormous propulsive capability. Nuclear Electric Propulsion (NEP) can effectively provide the required total impulse. The power source must be nuclear because the solar energy reaching Saturn in only 1% of that at the Earth. An important aspect of this mission is the ability of the low thrust propulsion system to continuously boost the spacecraft above the ring plane as it spirals in toward Saturn, thus enabling scientific measurements of ring particles from only a few kilometers. The NEP system assumed for this mission employs a nuclear reactor heat source, a thermal-to-electric conversion system, and a mercury ion engine electric propulsion system. Author (ESA)

N85-26544*# California Univ., Los Angeles. Dept. of Chemistry and Biochemistry.
HIGH PRESSURE COSMOCHEMISTRY APPLIED TO MAJOR PLANETARY INTERIORS: EXPERIMENTAL STUDIES Status Report
Malcolm F. Nicol, Mary Johnson, and Steven Boone 1 May 1985 11 p
(Grant NAGw-104)
(NASA-CR-175715; NAS 1.26:175715) Avail: NTIS HC A02/MF A01 CSCL 03B

The measurement of equilibria in binary fluid-solid systems in diamond anvil cells, represents a major advance of the art of high-pressure experimentation. Vibrational spectroscopy, direct visual observations, and X-ray diffraction crystallography of materials confined in externally heated cells are the primary experimental probes being used. Adiabats in these systems are being measured in order to constrain models of heat flow in these bodies and to detect phase transitions by thermal anomalies. Other studies are directed toward interpreting high pressure reactions in these systems that are suggested by shockwave measurements, and developing methods for reaching high temperatures and high pressures of planetary interest in diamond cells. The overall objective of this project is to determine the properties of the H2-He-H2O-HN3-CH4 system and related small-molecule systems that are needed to constrain theoretical models of the interiors of the major planets. A.R.H.

N85-26545*# Cornell Univ., Ithaca, N.Y. Center for Radiophysics and Space Research.
JUPITER/VOYAGER DATA ANALYSIS Final Report
J. Veverka May 1985 9 p refs
(Grant NAGw-193)
(NASA-CR-175723; NAS 1.26:175723) Avail: NTIS HC A02/MF A01 CSCL 03B

The extent to which the unusual spectral properties of Io and Alamathea can be accounted for by sulfur glass or at least by sulfur rich glasses was investigated. Whether or not the temperature dependence of the characteristic spectrum of pure sulfur can be used to set limits on the abundance of sulfur as a surface constituent of Io was also explored. Data from Voyager imaging observations of Saturn's small satellites, of the unusual retrograde satellite Phoebe, and of Hyperion were also reduced, analyzed, and interpreted. A.R.H.

N85-26546*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ELECTRONS AND COSMIC RAY PRODUCED PROTONS IN SATURN'S INNER MAGNETOSPHERE
T. G. Northrop and Walker Fillius (California Univ., La Jolla) [1985] 29 p refs
(NASA-TM-87469; NAS 1.15:87469) Avail: NTIS HC A03/MF A01 CSCL 03B

The Cerenkov detector on Pioneer 11 previously observed Crand protons above 600 MeV in Saturn's inner magnetosphere, mixed with a poorly understood background of energetic electrons. The electron count is separated from the proton counts and the first-order angular distributions are established for each species. To do this the theoretical relationships among the harmonic coefficients of the count rate is used as a function of spacecraft roll angle. The majority of the counts were electrons with energy above several MeV; i.e., with drift periods shorter than the satellite orbital resonance. The electrons have isotropic pitch angle distributions, and the protons pancake over most of the region between Mimas and the rings, although there is a small region of dumbbell proton distributions in the vicinity of Janus and epimetheus. Author

N85-26547*# New York Univ., New York. Dept. of Applied Science.
THE MARTIAN CLIMATE: ENERGY BALANCE MODELS WITH CO2/H2O ATMOSPHERES Semiannual Status Report, 1 Sep. 1984 - 28 Feb. 1985
Martin I. Hoffert 1985 12 p refs

(Grant NAGw-573)
(NASA-CR-175722; NAS 1.26:175722) Avail: NTIS HC A02/MF A01 CSCL 03B

Coupled equations are developed for mass and heat transport in a seasonal Mars model with condensation and sublimation of CO2 at the polar caps. Topics covered include physical considerations of planetary as mass and energy balance; effects of phase changes at the surface on mass and heat flux; atmospheric transport and governing equations; and numerical analysis. A.R.H.

N85-26548*# Lunar and Planetary Inst., Houston, Tex.
SIXTEENTH LUNAR AND PLANETARY SCIENCE CONFERENCE. PRESS ABSTRACTS Abstracts Only
1985 93 p refs Conf. held in Houston, Tex., 11-15 Mar. 1985 Sponsored by NASA. Johnson Space Center
(NASA-CR-175692; NAS 1.26:175692; LPI-Contrib-559) Avail: NTIS HC A05/MF A01 CSCL 03B

A broad range of topics concerned with lunar and planetary science are discussed. Topics among those included are, the sun, the planets, comets, meteorities, asteroids, satellites, space exploration, and the significance of these to Earth. For individual titles, see N85-26549 through N85-26574.

N85-26549*# Hawaii Inst. of Geophysics, Honolulu. Planetary Geosciences Div.
ASTEROID AMPHITRITE: SURFACE COMPOSITION AND PROSPECTS FOR THE POSSIBLE GALILEO FLYBY Abstract Only
Jeffrey F. Bell, Jonathon C. Gradie, B. Ray Hawke, Thomas B. McCord, and Michael J. Gaffey (Rensselaer Polytechnic Inst.) *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 1-5 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

Studies of the trajectory of the Galileo mission to Jupiter recently revealed that the spacecraft can pass close to one of the largest asteroids (#29 Amphitrite). NASA has therefore altered the mission plan of the Galileo spacecraft to include a possible close flyby of Amphitrite in early December 1986, if the condition of the spacecraft allows. If this option is actually implemented, Amphitrite will become the only asteroid for which any high-spatial resolution images and reflection spectra will be available. To evaluate the value of this data and place Amphitrite in the context of the more than 600 asteroids for which some compositional information exists. Existing data was reexamined, new telescopic spectra of Amphitrite were obtained, and simulated Galileo data sets were constructed. G.L.C.

N85-26550*# Washington Univ., St. Louis, Mo. Center for the Space Sciences.
EVIDENCE IN METEORITES FOR AN ACTIVE EARLY SUN Abstract Only
M. W. Caffee, J. N. Goswami (Physical Research Lab., Ahmedabad, India), C. M. Hohenberg, and T. D. Swindle *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 6-8 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

The amounts of neon-21 found in meteorite particles indicate that the Sun experienced a period of intense solar flare activity approximately 4.5 billion years ago. G.L.C.

N85-26551*# Rice Univ., Houston, Tex.
INTERSTELLAR Al-26 AND EXCESS Mg-26 Abstract Only **c90**
Donald D. Clayton *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 9-11 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

Evidence of a possible supernova explosion that occured very near the Earth is presented by the presence of radioactive 26 Aluminum (26 Al). The time of the supernova explosion is placed at approximately 100,000 years ago and is partially supported by cosmic gamma ray measurements from both HEAO 3 and the Solar Maximum Mission. G.L.C.

N85-26552*# Arizona Univ., Tucson. Dept. of Planetary Science.
GANYMEDE AND CALLISTO: BEAUTY IS ONLY SKIN DEEP Abstract Only
Steven K. Croft *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 12-14 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

Ganymede and Callisto, the two giant icy satellites of Jupiter, have very nearly the same size, composition, and location in the solar system, yet their surfaces are profoundly different. A new scenario of their geologic histories indicates that the differences may be only skin deep. G.L.C.

N85-26553*# Chicago Univ., Ill.
REFRACTORY INCLUSIONS IN THE ORNANS C30 CHONDRITE Abstract Only
Andrew M. Davis *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 15-17 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

Several types of metedorites contain unusual objects 10 micrometers to 2 centimeters across that are enriched in refractory elements such as calcium, aluminum and titanium. These objects, commonly known as refractory inclusions, are most abundant in the meteorites known as carbonaceous chondrites. The refractory inclusions that have been found in the Ornans metedorite, a member of a little-studied group of carbonaceous chondrites are described. Some refractory inclusions in Ornans resemble those found in other meteorites, while others are unlike any seen before. The unusual inclusions in Ornans contain minerals with extraordinary enrichments in highly refractory elements. G.L.C.

N85-26554*# Rochester Univ., N. Y. Dept. of Geological Sciences.
Nd-ISOTOPIC EVIDENCE FOR THE ORIGIN OF THE SUDBURY COMPLEX BY METEORITIC IMPACT Abstract Only
B. E. Faggart, A. R. Basu, and M. Tatsumoto (Geological Survey, Denver) *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 19-23 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

A Neodymium isotopic investigation was undertaken in order to determine the possibility that the Sudbury geological structure in Ontario, Canada was formed by meteoritic impact. Conclusive evidence points to the melting of crustal rocks by way of meteoritic impact in the forming of the Sudbury structure. G.L.C.

N85-26555*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PERIODIC COMETARY SHOWERS: REAL OR IMAGINARY? Abstract Only **c90**
R. A. F. Grieve (Dept. of Energy, Mines and Resources, Ottawa), V. L. Sharpton (Dept. of Energy, Mines and Resources, Ottawa), A. K. Goodacre (Dept. of Energy, Mines and Resources, Ottawa), and J. B. Garvin *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 24-27 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

Since the initial reports in 1980, a considerable body of chemical and physical evidence has been accumulated to indicate that a major impact event occurred on earth 65 million years ago. The effects of this event were global in extent and have been suggested as the cause of the sudden demise or mass extinction of a large percentage of life, including the dinosaurs, at the end of the geologic time period known as the Cretaceous. Recent statistical analyses of extinctions in the marine faunal record for the last 250 million years have suggested that mass extinctions may occur with a periodicity of every 26 to 30 million years. Following these results, other workers have attempted to demonstrate that these extinction events, like that at the end of the Cretaceous, are temporally correlated with large impact events. A

recent scenario suggests that they are the result of periodic showers of comets produced by either the passage of the solar system through the galactic plane or by perturbations of the cometary cloud in the outer solar system by a, as yet unseen, solar companion. This hypothesized solar companion has been given the name Nemesis. G.L.C.

N85-26556*# Max-Planck-Inst. fuer Kernphysik, Heidelberg (West Germany).
DUST EMISSION OF COMET HALLEY AT LARGE HELIOCENTRIC DISTANCES Abstract Only **c90**
E. Gruen, G. Schwehm (ESA. European Space Operations Centre, Darmstadt, West Germany), Lutz Massonne (ESA. European Space Operations Centre, Darmstadt, West Germany), Juergen Fertig (ESA. European Space Operations Centre, Darmstadt, West Germany), and U. Graser (Max-Planck-Inst. fuer Astronomie, Heidelberg) *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 28-31 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

Comet Halley is currently approaching the inner solar system. Four spacecrafts (NASA's spacecraft, two Russian Vega probes and the Japanese MS-T5 spacecraft) have already been launched to encounter the comet in March 1986. Two additional Halley probes (the European Giotto spacecraft and another Japanese Planet-A probe) will be launched in mid-85 to join the armada. Observations of dust emissions from Halley's Comet are discussed. The evaporation of cometary ices causes the emission of particulates from the nucleus. These observations will be used to determine the fly-by strategy of the Giotto spacecraft by taking into account the distribution of dust in the vicinity of the nucleus and the associated hazard for the space mission. B.W.

N85-26557*# Chicago Univ., Ill.
CARBON ISOTOPES IN BULK CARBONACEOUS CHONDRITES Abstract Only
Jerome Halbout, Toshiko K. Mayeda, and Robert N. Clayton *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 32-34 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

The chemical and physical processes involved in the formation of the solar system are examined. Primitive matter has been found on a microscopic scale in a variety of meteorites: fragments of small solar system bodies that were never part of a large planet. This primitive matter has, in most cases, been identified by the presence of anomalous abundances of some isotopes of the chemical elements. Of particular interest for carbon isotope studies are the primitive meteorites known as carbonaceous chondrites. Using a selective oxidation technique to sort out the carbon contained in different chemical forms (graphite, carbonates, and organic matter), four carbonaceous chondrites are analyzed. The presence of the (13) C-rich component was confirmed and additional carbon components with different, but characteristic, isotopic signatures were resolved. B.W.

N85-26558*# Arizona Univ., Tucson.
OCCULTATION DETECTION OF A NEPTUNE RING SEGMENT Abstract Only
W. B. Hubbard, A. Brahic (Observatoire de Paris), P. Bouchet (European Southern Observatory, Santiago de Chile), L.-R. Elicer (Cerro Tololo Inter-American Observatory), R. Haefner (Technische Univ., Munich), J. Manfroid (Inst. d'Astrophysique, Liege), F. Roques (Observatoire de Paris), B. Sicardy (Observatoire de Paris), and F. Vilas *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 35-37 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

A stellar occulation event of Neptune revealed a ring segment that was previously undetected. It appears that the object is not a complete ring, but rather a localized swarm of particles which follows a ring orbit over a limited range of longitudes. To avoid confusion with the standard use of the word ring it is suggested that the feature be called an arc. The distance of the arc zone is not precisely known because so far there has been no confirmed occultation by both an arc and the planet. B.W.

N85-26559*# Arizona Univ., Tucson. Lunar and Planetary Lab.
IDENTIFICATION OF THE YOUNGEST METEORITES AND A DISCUSSION OF THE POSSIBILITY THAT THEY CAME FROM MARS Abstract Only
John H. Jones *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 38-41 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

The shergottites are a group of basaltic meteorites which are very similar in appearance to terrestrial basalts. On the Earth basalts are formed by volcanic activity. Because the shergottites so resemble terrestrial basalts and because they are apparently very young (< 1.3 billion years), it has been inferred that they come from a large planet. Small planets and asteroids lose heat from their interiors quickly and stop producing hot basaltic liquids early in their history. It appears that gases trapped in one shergotite found in Antarctica (BETA 79001) are chemically similar to the martian atmosphere (as measured by the Viking mission). The controversial speculation that the shergotites are samples of mars is examined in detail. B.W.

N85-26560*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXAMINATION OF RETURNED SOLAR-MAX SURFACES FOR IMPACTING ORBITAL DEBRIS AND METEOROIDS Abstract Only
D. J. Kessler, H. A. Zook, A. E. Potter, D. S. McKay, U. S. Clanton (DOE, Las Vegas, Nev.), J. L. Warren (Northrop Corp., Houston, Tex.), L. A. Watts (Northrop Corp., Houston, Tex.), R. A. Schultz (Purdue, Univ., Lafayette, Ind.), L. S. Schramm (Lockheed Missiles and Space Co., Houston, Tex.), S. J. Wentworth (Lockheed Missiles and Space Co., Houston, Tex.) et al *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 42-43 refs (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

Previous theoretical studies predicted that in certain regions of earth orbit, the man-made earth orbiting debris environment will soon exceed the interplanetary meteoroid environment for sizes smaller than 1 cm. The surfaces returned from the repaired Solar Max Mission (SMM) by STS 41-C on April 12, 1984, offered an excellent opportunity to examine both the debris and meteoroid environments. To date, approximately 0.7 sq. met. of the thermal insulation and 0.05 sq. met of the aluminum louvers have been mapped by optical microscope for crater diameters larger than 40 microns. Craters larger in diameter than about 100 microns found on the initial 75 micron thick Kapton first sheet on the MEB (Main Electronics Box) blanket are actually holes and constitute perforations through that blanket. The following populations have been found to date in impact sites on these blankets: (1) meteoritic material; (2) thermal paint particles; (3) aluminum droplets; and (4) waste particles. B.W.

N85-26561*# Washington Univ., St. Louis, Mo. Center for the Space Sciences.
ELECTROLYSIS OF SIMULATED LUNAR MELTS Abstract Only
Robert H. Lewis, David J. Lindstrom, and Larry A. Haskin *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 44-46 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

Electrolysis of molten lunar soil or rock is examined as an attractive means of wresting useful raw materials from lunar rocks. It requires only hat to melt the soil or rock and electricity to electrolyze it, and both can be developed from solar power. The conductivities of the simple silicate diopside, Mg CaSi2O6 were measured. Iron oxide was added to determine the effect on conductivity. The iron brought about substantial electronic conduction. The conductivities of simulated lunar lavas were measured. The simulated basalt had an AC conductivity nearly a fctor of two higher than that of diopside, reflecting the basalt's slightly higher

total concentration of the 2+ ions Ca, Mg, and Fe that are the dominant charge carriers. Electrolysis was shown to be about 30% efficient for the basalt composition. B.W.

N85-26562*# Louisiana State Univ., Baton Rouge. Dept. of Geology.
CHONDRULE-LIKE PARTICLES PROVIDE EVIDENCE OF EARLY ARCHEAN METEORITE IMPACTS, SOUTH AFRICA AND WESTERN AUSTRALIA Abstract Only
Donald R. Lowe and Gary R. Byerly *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 47-50 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

The evolution of the Earth and the Earth crust was studied. Two layers, that contain abundant unusual spherical particles which closely resemble chondroules were identified. Chondrules occur on small quantities in lunar soil, however, they are rare in terrestrial settings. Some chondrules in meteorites were formed on the surfaces of planet sized bodies during impact events. Similar chondrule like objects are extremely rare in the younger geologic record and these abundances are unknown in ancient deposits, except in meteorites. It is suggested that a part of the Earth's terminal bombardment history, and conditions favoring chondrule formation existed on the early Earth. E.A.K.

N85-26563*# Centre National de la Recherche Scientifique, Orsay (France).
MINING COSMIC DUST FROM THE BLUE ICE LAKES OF GREENLAND Abstract Only c90
M. Maurette, D. E. Brownlee (Washington Univ., Seattle), L. Fehrenback, C. Hammer (Copenhagen Univ.), C. Jehano (CNRS, Gif-sur-Yvette, France), and H. H. Thomsen (Grolands Geologiske Undersoegelse, Copenhagen) *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 51-53 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

Extraterrestrial material, most of which invisible settles to Earth's surface as dust particles smaller than a millimeter in size were investigated. Particles of 1/10 millimeter size fall at a rate of one/sq m/yr collection of extraterrestrial dust is important because the recovered cosmic dust particles can provide important information about comets. Comets are the most important source of dust in the solar system and they are probably the major source of extraterrestrial dust that is collectable at the Earth's surface. A new collection site for cosmic dust, in an environment where degradation by weathering is minimal is reported. It is found that the blue ice lakes on the Greenland ice cap provide an ideal location for collection of extraterrestrial dust particles larger than 0.1 mm in size. It is found that the lakes contain large amounts of cosmic dust which is much better preserved than similar particles recovered from the ocean floor. E.A.K.

N85-26564*# National Air and Space Museum, Washington, D.C. Center for Earth and Planetary Studies.
THE MARS ANCIENT CRATERED TERRAIN, SMOOTH PLAINS BOUNDARY: IMPLICATIONS OF VIKING COLOR DATA FOR EVOLUTION OF THE AMENTHES REGION Abstract Only
Ted A. Maxwell and Thomas R. Watters *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 54-56 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

The global color set compiled by the Mars Consortium was investigated. The problem of application of the martian surface color data to geologic interpretation are atmospheric contributions which increase with latitude, and the high correlation among the three color bands. In southern Amenthes the classified units show areas of possible mixing between cratered tarrain and smooth plains. It is suggested that some geologically meaningful correlation exists between surface units and the transformed color data in the Amenthes region. The knobby terrain protruding through the plains units appears to be remnants of ancient cratered terrain extending northward beneath the more youthful smooth plains.
Author

N85-26565*# Tennessee Univ., Knoxville. Dept. of Geological Sciences.
WHAT WE KNOW ABOUT MARS (BUT OTHERWISE WOULDN'T) IF IT IS THE SHERGOTTITE PARENT BODY Abstract Only
Harry Y. McSween, Jr. *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 57-58 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

The evidence that some meteorites may actually be samples of fairly large solar system bodies, specifically the moon and the planet Mars was presented. The proposed martian meteorites, called shergottites are igneous rocks that crystallized from molten magmas. Their crystallization ages are much too young to have formed by internal melting within small asteroids, and the unusual chemical composition of gases trapped when these rocks were severely shocked matches that of the martin atmosphere measured by Viking. The implications of these samples for martian evolution was discussed and suggested, that if Mars is the shergottite parent body, the martian interior is much more like that of the earth than has been previously thought. Shergottites explain presence of small magnetic field indicate that volatileement concentratins in Mars should be similar to the Earth, and explain the great lengths of volcanic flows on the martian surface. E.A.K.

N85-26566*# Arizona Univ., Tucson. Lunar and Planetary Lab.
THE IMPACT EJECTION OF LIVING ORGANISMS INTO SPACE Abstract Only c55
H. J. Melosh *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 59-62 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 06B

The possibility of natural processes to blast living organisms into space was examined. It is suggested that rocks ejected from the Earth by a giant meteorite or comet impact can carry microorganisms into space. Such microscopic Earth life would have an opportunity to colonize the other planets if it can survive the rigors of space until it falls into the atmosphere of a hospitable planet. E.A.K.

N85-26567*# Los Alamos Scientific Lab., N. Mex. Isotope and Nuclear Chemistry Div.
A SEARCH FOR EVIDENCE OF LARGE BODY EARTH IMPACTS ASSOCIATED WITH BIOLOGICAL CRISIS ZONES IN THE FOSSIL RECORD Abstract Only c55
C. J. Orth, J. S. Gilmore, and J. D. Knight *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 63-67 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 06B

The natural history of the Earth, how the present plant and animal species developed, how others completely died out, etc., was studied. The rock strata sampled and studied were at the time of deposition at sea bottom. It was found that, exactly at the stratigraphic level corresponding to the extinction, a thin clay layer was greatly enriched in the the rare element iridium. It was hypothesized that the excess irridium at the boundary came from a large steroid like object that hit the earth, and that the impact of this object threw up a dust cloud dense enough and long lasting enough to bring about the extinction of a wide variety of plants and animals, producing the unique break in in the fossil record, the cretaceous-tertiary boundary. The same iridium and platinum metals enrichement are found in a thin clay layer that corresponds with the boundary as difined by sudden radical changes in plant populations. The irridium enrichement is confirmed at other fresh water origin rites in the Raton Basin. E.A.K.

N85-26568*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TELESCOPE IN LUNAR ORBIT Abstract Only c89
Thornton Page *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 68-70 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03A

The use of a large telescope in high lunar orbit 4000 km above the Moon's equator is proposed. It is recognized that the Hubble Space Telescope (ST), will provide the necessary capabilities if it can be transferred to lunar orbit. The Orbital Transfer Vehicle (OTV), will be able to scan the lunar surface, locate small outcrops of minerals important to base development, support early base operations and undertake detailed geophysical exploration of the whole lunar surface. E.A.K.

N85-26569*# Chicago Univ., Ill.
A SPECTACULAR NITROGEN ISOTOPE ANOMALY IN BENCUBBIN Abstract Only c90
Carol A. Prombo and Robert N. Clayton *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 71-73 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

Results of isotopic measurements on an unusual stony-iron meteorite named Bencubbin, which was found in Western Australia in 1930, are reported. Nitrogen from both the metallic and stony parts of the Bencubbin meteorite was analyzed, and in both materials large excesses of (15)N were found, resulting in values of the (14)N/(15)N abundance ratios as low as 137. That is, (15)N is enriched in Bencubbin by about a factor of two relative to terrestrial nitrogen. This is the largest (15)N enrichment of any known natural material. The effect is so large that chemical processes are probably inadequate to account for it. Nuclear processes which may be responsible for the anomalous isotope abundance are discussed. M.G.

N85-26570*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MARS: SEASONALLY VARIABLE RADAR REFLECTIVITY Abstract Only
L. E. Roth, G. S. Downs, R. S. Saunders, and G. Schubert (California Univ., Los Angeles) *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 74-77 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

The 1971/1973 Mars data set acquired by the Goldstone Solar System Radar was analyzed. It was established that the seasonal variations in radar reflectivity thought to occur in only one locality on the planet (the Solis Lacus radar anomaly) occur, in fact, over the entire subequatorial belt observed by the Goldstone radar. Since liquid water appears to be the most likely cause of the reflectivity excursions, a permanent, year-round presence of subsurface water (frozen or thawed) in the Martian tropics can be inferred. M.G.

N85-26571*# New Mexico Univ., Albuquerque. Inst. of Meteoritics.
ORIGIN AND EVOLUTION OF ORDINARY CHONDRITE METEORITES Abstract Only
Edward R. D. Scott, G. Jeffrey Taylor, and Klaus Keil *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 78-80 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

The effects of heating on the chemical composition, mineralogy, and texture of chondrite meteorites are discussed chondrite origin and evolution. Various asteroidal and nebular heating mechanisms are considered to account meteorite compositions. M.G.

N85-26572*# Tokyo Univ. (Japan). Mineralogical Inst.
MINERALOGICAL STUDIES OF LUNAR METEORITES AND THEIR LUNAR ANALOGS Abstract Only
Hiroshi Takeda, H. Mori, M. Miyamoto, and T. Ishii *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 81-83 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

The minerology and textural properties of three lunar meteorites (Yamato 791197, ALH81005, and Yamato 82192) were analyzed and compared with lunar surface rock samples. The chemical composition and textures of pyroxene and the occurrance of glass matrices were specifically addressed. The study of glass in the lunar meteorites suggests that the glass was not produced by a meteorite impact which excavated the mass into orbit towards the Earth. The glass had been devitrified on the lunar surface before the excavation, and new glass was not produced by the last impact. M.G.

N85-26573*# Cornell Univ., Ithaca, N.Y. Lab. for Planetary Studies.
DUST DEVILS ON MARS Abstract Only
P. Thomas and P. Gierasch *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 84-85 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

Large columns of dust have been discovered rising above plains on Mars. The storms are probably analogous to terrestrial dust devils, but their size indicates that they are more similar to tornadoes in intensity. They occur at locations where the soil has been strongly warmed by the Sun, and there the surface is smooth and fine grained. These are the same conditions that favor dust devils on Earth. Warm gas from the lowest atmospheric layer converges and rises in a thin column, with intense swirl developing at the edge of the column. In one area a mosaic of Viking images shows 97 vortices in a three day period. This represents a density of vortices of about one in each 900 square kilometers. Thus, these dust devils may be important in moving dust or starting over dust storms. M.G.

N85-26574*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
ORIGIN OF MESOSIDERITES AS A NATURAL CONSEQUENCE OF PLANET FORMATION Abstract Only
John T. Wasson and Alan E. Rubin *In* Lunar and Planetary Inst. 16th Lunar and Planetary Sci. Conf. 1985 p 86-87 (For primary document see N85-26548 15-91)
Avail: NTIS HC A05/MF A01 CSCL 03B

The mineral composition of mesosiderites is described and a theory of the origin and evolution of these meteorites is presented. It is suggested that the asteroid parent body of the mesosiderites also formed in the inner solar system, perhaps just within the orbit of Mars. As a result of close planetary encounters, some bodies that formed near Earth or Venus were gravitationally perturbed into non-circular orbits; a few such bodies passed through the mesosiderite region at high relative velocities, colliding with and destroying a few of the native asteroids. Olivine-rich silicate mantles shattered into small pieces, but the stronger metal cores remained as large fragments. Much of the debris remained in circular orbits and accreted to the basaltic regoliths of intact native asteroids at low relative velocities. The large core fragments that collided with the crust greatly enriched restricted regions of the surface in metal. These localized regions were the mesosiderite progenitors; they accounted for only about 1% of the surface area of the parent bodies. M.G.

N85-26575# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
COMET SHOWERS AND NEMESIS, THE DEATH STAR
Jack G. Hills 1984 9 p refs Presented at the Southwest Regional Conf. for Astron. and Astrophys., Los Alamos, N. Mex., 1 May 1984
(Contract W-7405-eng-36)
(DE85-003736; LA-UR-84-3688; CONF-8405262-1) Avail: NTIS HC A02/MF A01

The recently proposed hypothesis that the periodic extinctions of terrestrial species are the result of comet showers catalyzed by a hypothetical distance solar companion, Nemesis, is discussed. The evidence for periodic extinction in paleontological records, effects of comet collisions, and the Nemesis orbit are addressed. DOE

N85-26576# Los Alamos Scientific Lab., N. Mex.
CLOSER LOOK AT LUNAR VOLCANISM
D. T. Vaniman, G. Heiken, and G. J. Taylor (New Mexico Univ.,

Albuquerque) 1984 20 p refs Presented at the Lunar Bases and Space Activities of the 21st Century Conf., Washington, D.C., 29 Oct. 1984
(Contract W-7405-eng-36)
(DE85-006663; LA-UR-85-311; CONF-8410230-3) Avail: NTIS HC A02/MF A01

Although the American Apollo and Soviet Lunar missions concentrated on mare basalt samples, major questions remain about lunar volcanism. Lunar field work will be indispensable for resolving the scientific questions about ages, compositions, and eruption processes of lunar volcanism. From a utilitarian standpoint, a better knowledge of lunar volcanism will also yield profitable returns in lunar base construction (e.g., exploitation of rille or lava-tube structures) and in access to materials such as volatile elements, pure glass, or ilmenite for lunar industry. DOE

N85-25299# Joint Publications Research Service, Arlington, Va.
SYSTEMATIC AND RANDOM DEFORMATIONS OF ORBITS OF LONG-PERIOD COMETS Abstract Only
V. A. Antonov and Z. P. Todriya *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 22 Transl. into ENGLISH from Pisma v Astronomicheskiy Zh. (USSR), v. 10, no. 5, May 1984 p 394-396 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25312# Joint Publications Research Service, Arlington, Va.
SOME NEW PHOTOMETRIC DATA FORM PANORAMIC PICTURES TAKEN BY LUNOKHOD-2 Abstract Only
V. V. Busarev, V. V. Zasetskiy, Y. A. Kantarovskiy, V. I. Titov, and M. Y. Shevchenko *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 32 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 609-616 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25321# Joint Publications Research Service, Arlington, Va.
RESULTS ON VOLCANISM, SURFACE GEOLOGY FROM VENERA-15, -16 Abstract Only
B. Konovalov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 41-42 Transl. into ENGLISH from Izvestiya (USSR), 15 Dec. 1984 p 3 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25322# Joint Publications Research Service, Arlington, Va.
INTERPRETATION OF VENUS GRAVITATIONAL ANOMALIES Abstract Only
Y. A. Tarakanov, N. S. Kambarov, V. A. Prikhodko, and D. R. Bondarenko *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 43 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 617-621 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25323# Joint Publications Research Service, Arlington, Va.
STRUCTURE AND ORIGIN OF MARTIAN SATELLITES Abstract Only
V. N. Zharkov, A. V. Kozenko, and S. V. Mayeva *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 44 Transl. into ENGLISH from Astronomicheskiy Vestnik (USSR), v. 18, no. 2, Apr.-Jun. 1984 p 83-99 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25324# Joint Publications Research Service, Arlington, Va.
DISTRIBUTION OF GRAVITY AND PLUMB LINE DEFLECTION AT MARTIAN SURFACE Abstract Only
T. G. Maksimova and N. A. Chuykova *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 44-45 Transl. into ENGLISH from Vestnik Moskovskogo Univ., Ser. 3: Fiz., Astron. (USSR), v. 25, no. 1, Jan.-Feb. 1984 p 64-69 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25325# Joint Publications Research Service, Arlington, Va.
PHOTOMETRIC STUDY OF PLUTO NEAR PERIHELION. PART 2: REFINEMENT OF ROTATION PERIOD: COLOR INDICES Abstract Only
V. M. Lyutyy and V. P. Tarashchuk *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 45 Transl. into ENGLISH from Pisma v Astron. Zh. (USSR), v. 10, no. 7, Jul. 1984 p 542-548 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N85-26577*# Resource Management Associates, Inc., Lafayette, Calif.
DEVELOPMENT OF A GLOBAL 3-D MAGNETOHYDRODYNAMIC COMPUTATIONAL MODEL FOR SOLAR WIND/COMETARY AND PLANETARY STUDIES Quarterly Progress Report
Stephen S. Stahara [1985] 7 p
(Contract NASw-4011)
(NASA-CR-175724; NAS 1.26:175724; QPR-2) Avail: NTIS HC A02/MF A01 CSCL 03B

Progress is reported in the development of a global, 3-D magnetohydrodynamic computational model to quantitatively describe the detailed continuum field and plasma interaction process of the solar wind with cometary and planetary magneto/ionopause shapes. Activities described include enhancements to the present Level 1 model, development of the 3-D gas dynamic flow field solvers for the Level 2 model, and continued development of the 3-D frozen magnetic field solver for the Level 2 model. A.R.H.

N85-26578*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STREAM DYNAMICS BETWEEN 1 AU AND 2 AU: A DETAILED COMPARISON OF OBSERVATIONS AND THEORY
L. Burlaga, V. Pizzo, A. Lazarus, and P. Gazis Apr. 1984 49 p refs
(NASA-TM-86086; NAS 1.15:86086) Avail: NTIS HC A03/MF A01 CSCL 03B

A radial alignment of three solar wind stream structures observed by IMP-7 and -8 (at 1.0 AU) and Voyager 1 and 2 (in the range 1.4 to 1.8 AU) in late 1977 is presented. It is demonstrated that several important aspects of the observed dynamical evolution can be both qualitatively and quantitatively described with a single-fluid 2-D MHD numerical model of quasi-steady corotating flow, including accurate prediction of: (1) the formation of a corotating shock pair at 1.75 AU in the case of a simple, quasi-steady stream; (2) the coalescence of the thermodynamic and magnetic structures associated with the compression regions of two neighboring, interacting, corotating streams; and (3) the dynamical destruction of a small (i.e., low velocity-amplitude, short spatial-scale) stream by its overtaking of a slower moving, high-density region associated with a preceding transient flow. The evolution of these flow systems is discussed in terms of the concepts of filtering and entrainment. Author

N85-26579# Oak Ridge National Lab., Tenn.
PROPOSED SOLAR NEUTRINO EXPERIMENT USING (81)Br(nu, e(-E)) (81)Kr
G. S. Hurst (Tennessee Univ., Knoxville), C. H. Chen, S. D. Kramer, and S. L. Allman Dec. 1984 11 p refs Presented at the Conf. on Solar Neutrinos and Neutrino Astronomy, Lead, S.D., 23-25 Aug. 1984
(Contract DE-AC05-84OR-21400)
(DE85-004802; CONF-8408132-6) Avail: NTIS HC A01/MF A01

It has now been shown that it is feasible to measure the (7)Be neutrino source in the Sun by using the reaction (81)Br(nu,e(-))(81)Kr in a radiochemical experiment. Such an experiment would

be quite similar to the Davis, Cleveland, and Rowley method for measuring the (8)B neutrino using (37)Cl(nu,e(-))(37)Ar except that the resonance ionization spectroscopy (RIS) method (instead of decay counting) would be employed to count the 2 x 10(5)-yr (81)Kr atoms. DOE

N85-26580# California Univ., Los Angeles. Dept. of Earth and Space Sciences.
COUPLING OF THE SOLAR WIND TO MEASURES OF MAGNETIC ACTIVITY
R. L. McPherron, R. A. Fay, C. R. Garrity, L. F. Bergatze, D. N. Baker (Los Alamos Scientific Lab., N. Mex.), C. Robert Clauer (Stanford Univ., Calif.), and Craig Searle (Sandia Labs., Albuquerque, N. Mex.) 1984 7 p refs Presented at Symp. on the Achievements of the IMS, Graz, 25 Jun. - 7 Jul. 1984
(Contract W-7405-eng-36)
(DE85-002415; LA-UR-84-3331; CONF-8406167-6) Avail: NTIS HC A02/MF A01

The technique of linear production filtering was used to generate empirical response functions relating the solar wind electric field to the most frequently used magnetic indices. Two data sets, one from 1967 to 1968 and one from 1973 to 1974, provide the information needed to calculate the empirical response functions. These functions were convolved with solar wind observations obtained during ims to predict the indices. These predictions are compared with the observed indices during two, three-day intervals. Differences between the observed and predicted indices are discussed in terms of the linear assumption and in terms of physical processes other than direct solar wind - magnetosphere interaction. Author

N85-26581# Bern Univ. (Switzerland). Inst. of Applied Physics.
BERN SOLAR DATA FOR JANUARY-DECEMBER 1984
G. Bruggmann, M. Fuhrer, A. Magun, H. Marti, M. Staehli, and J.-P. Wuelser 1984 29 p
(Rept-51) Avail: NTIS HC A03/MF A01

The results of the standard measurements carried out at the solar observatory are presented. The measurements show start, maximum, duration, peak flux, and circular polarization at peak as percentage of outstanding events. Author (ESA)

N85-25287# Joint Publications Research Service, Arlington, Va.
ELEMENTARY SUNSPOT ENERGY MODEL Abstract Only
A. A. Solovyev *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 13-14 Transl. into ENGLISH from Astronomicherskiy Zh. (USSR), v. 61. no. 4, Jul.-Aug. 1984 p 764-770 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25288# Joint Publications Research Service, Arlington, Va.
MODELING 22-YEAR SOLAR ACTIVITY CYCLE WITHIN FRAMEWORK OF DYNAMO THEORY WITH ALLOWANCE FOR PRIMARY FIELD Abstract Only
M. I. Pudovkin and Y. Y. Benevolenskaya *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 14-15 Transl. into ENGLISH from Astronomicheskiy Zh. (USSR), v. 61, no. 4, Jul.-Aug. 1984 p 783-788 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25310# Joint Publications Research Service, Arlington, Va.
SPACE-TIME FEATURES OF SOLAR COSMIC RAY PENETRATION INTO HIGH LATITUDE REGIONS OF EARTH'S MAGNETOSPHERE BASED ON INTERCOSMOS-19 SATELLITE DATA Abstract Only
G. A. Glikhov, Y. P. Kratenko, Y. V. Mineyev, and Y. S. Spirkova *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 31 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 594-598 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N85-26582 Minnesota Univ., Minneapolis.
THE PROPAGATION OF ULTRAHEAVY COSMIC RAYS Ph.D. Thesis
Nancy Ridolfi Brewster 1984 150 p
Avail: Univ. Microfilms Order No. DA8501855

This thesis uses a mathematical model to analyze the passage, or propagation, of cosmic rays through the interstellar medium. The effects of varying different parameters of the model are studied to determine the sensitivity of predicted cosmic ray abundances to these parameters. The effects of assuming different elemental compositions at the source of the cosmic rays is also investigated. Several abundance ratios are identified as particularly sensitive to either changes in the propagation parameters or to the source composition. As part of the study of the input parameters to the model, an experiment was performed to measure the total and partial charge changing cross sections for a heavy nucleus, in this case (79)Au(197) with an incident energy of 990 MeV/nucleon, an energy comparable to that of the most abundant cosmic rays. Such cross sections are important parameters in cosmic ray propagation models, but very few of them, especially for the heaviest nuclei, have been measured. Dissert. Abstr.

N85-26583*# Alabama Univ., Huntsville.
SPACE RADIATION STUDIES FOR THE REPORTING PERIOD, JUNE 1983 - JULY 1984 Annual Report
21 Mar. 1985 13 p refs
(Contract NAS8-171411)
(NASA-CR-171411; NAS 1.26:171411) Avail: NTIS HC A02/MF A01 CSCL 03B

Two Active Radiation Dosimeters (ARD's) flown on Spacelab 1, performed without fault and were returned to Space Science Laboratory, MSFC for recalibration. During the flight in December 1983, performance was monitored at the Huntsville Operations Center (HOSC). Despite some problems with the Shuttle data system handling the VFI, it could be established that the ARD's were operating normally. Postflight calibrations of both units determined that sensitivities were essentially unchanged from preflight values. Flight tapes were received for approximately 60% of the flight and it appears that this is the total available. The next phase of effort will involve close collaboration with Space Science Laboratory, MSFC, in the analysis of this data. The Nuclear Radiation Monitor (NRM) was under assembly and testing at MSFC. Support was rendered in the areas of materials control and parts were supplied for the supplementary heaters, dome gas-venting device and photomultiplier tube housing. Performance characteristics of some flight-space photomultipliers were measured. Author

N85-26584*# Alabama Univ., Huntsville. Cosmic Ray Lab.
SPACE RADIATION STUDIES Interim Report, Jul. 1984 - Jan. 1985
5 Mar. 1985 13 p
(Contract NAS8-35354)
(NASA-CR-171410; NAS 1.26:171410) Avail: NTIS HC A02/MF A01 CSCL 03B

The overall data flow diagram for the nuclear radiation monitor to fly on Spacelab 2 was revised. The use of structured techniques for the software design appears to be working well. An example of the PASCAL pseudocode written to develop and document the software design is included. M.G.

N85-26585# California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.
SPACE STATION AS QUARK MATTER FACTORY
Miklos Gyulassy Nov. 1984 11 p refs

(Contract DE-AC03-76SF-00098)
(DE85-004606; LBL-18708) Avail: NTIS HC A02/MF A01

The theoretical arguments indicating that hadronic matter dissolves into a quark gluon plasma at energy densities only one order of magnitude above the energy density in nuclei are reviewed and it is pointed out that such energy densities can be achieved in nuclear collisions at 10 to 1000 AGev. Author

N85-26586# Los Alamos Scientific Lab., N. Mex.
LONG-TERM OBSERVATIONS OF CYG X-3 WITH VELA 5B
W. Priedhorsky 1984 8 p refs Presented at the 18th ESLAB Symp. on X-Ray Astron., The Hague, 5 Nov. 1984
(Contract W-7405-eng-36)
(DE85-005556; LA-UR-84-4011; CONF-8411151-1) Avail: NTIS HC A02/MF A01

Long term (1969 to 1979) observations of Cygnus X-3, obtained by the Vela 5B satellite are presented. The 3 to 12 keV light curve has 10 day time resolution. Cyg X-3 is a peculiar high luminosity X-ray source, radiating from the radio region to hard gamma rays of more than 10(16) eV. It has a 4.8 hour period, probably orbital, which is not resolved by the present analysis. Long term periodicities of approx. 17, 20, and 33 to 34 days have been reported by several authors, and explained as the effects of apsidal motion, precession, or an eccentric orbit. There is weak evidence for a 20 day flux variation. The light curve shows high and low states which alternate with a characteristic timescale of approximately 1 year. There is no counterpart, at this time resolution, of the giant radio outburst of September 1972. DOE

N85-26587# Fermi National Accelerator Lab., Batavia, Ill. Theoretical Astrophysics Group.
SUPERHEAVY MAGNETIC MONOPOLES AND THE STANDARD COSMOLOGY
Michael S. Turner Oct. 1984 24 p refs Presented at Monopole '83, Ann Arbor, Mich., 6 Oct. 1983 Prepared in cooperation with Chicago Univ., Ill.
(DE85-003922; FNAL/C-84/111-A; CONF-8310227-10) Avail: NTIS HC A02/MF A01

The superheavy magnetic monopoles predicted to exist in grand unified theories (GUTs) are for particle physics, astrophysics and cosmology. Astrophysical and cosmological considerations are invaluable in the study of the properties of GUT monopoles. Because of the glut of monopoles predicted in the standard cosmology for the simplest GUTs. The simplest GUTs and the standard cosmology are not compatible. This is a very important piece of information about physics at unification energies and about the earliest movements of the Universe. The cosmological consequences of GUT monopoles within the context of the standard hot big bang model are reviewed. E.A.K.

N85-26588# California Univ., Livermore. Lawrence Livermore Lab.
EXTRAGALACTIC ORIGIN OR GAMMA-RAY BURSTS, REVISION 1
Montgomery Johnson and Edward Teller 2 Nov. 1984 17 p Presented at the 6th Quantum Theory and the Struct. of Time and Space Symp., Tutzing, West Germany, 2-5 Jul. 1984
(Contract W-7405-eng-48)
(DE85-005622; UCRL-91744-Rev-1; CONF-8407110-1-Rev-1) Avail: NTIS HC A02/MF A01

Detectors of gamma-rays carried by satellites and later by high-flying balloons showed the existence of events lasting from 15 milliseconds to 100 seconds, arriving from all directions in space. A few hundred events were observed in a little more than a decade. The energy of gamma-rays range from a few kilovolts to millions of volts. It is indicated that considerable energy may be carried in some cases even above 10 MeV. The bulk of the energy appeared to be emitted between 100 and 200 keV. The simple facts about intensity distribution are compatible with two extreme assumptions but exclude intermediate hypotheses. Either the events occur in the galaxy in a region smaller than the thickness of the galaxy or they are of extragalactic origin and come from distant galaxies. In case of an extragalactic origin, the neutron star must attract and convert, about 2 x 10(30) grams or 10(-3) of the solar mass. It is the size of such events which deterred a detailed discussion of this alternative. DOE

N85-25292# Joint Publications Research Service, Arlington, Va.
PULSATIONS OF COSMIC RAY INTENSITIES BEFORE INCREASING FLUX OF RELATIVISTIC PARTICLES FROM SOLAR FLARES Abstract Only
S. A. Starodubtsev and A. T. Fillippov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 17 Transl. into ENGLISH from Geomagnetizm i Aeronomiya (USSR), v. 24, no. 4, Jul.-Aug. 1984 p 682-683 Original language document announced as A84-47527 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25293# Joint Publications Research Service, Arlington, Va.
CYCLIC CHANGES IN BAROMETRIC COEFFICIENT OF COSMIC RAY NEUTRON COMPONENT Abstract Only
O. G. Rogava and L. K. Shatashvili *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 17-18 Transl. into ENGLISH from Geofiz. Zh. (USSR), v. 6, no. 5, Sep.-Oct. 1984 p 73-75 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

N85-25317# Joint Publications Research Service, Arlington, Va.
SPACE RADIATION MONITOR OBSERVATIONS FROM SALYUT-4 ORBITAL STATION Abstract Only
V. I. Lyagushin, N. A. Mamontova, B. M. Makhmudov, M. A. Sarayeva, P. I. Shavrin, and Y. Y. Yushkov *In its* USSR Rept.: Space (JPRS-USP-85-003) 4 Mar. 1985 p 36 Transl. into ENGLISH from Kosmicheskiye Issled. (USSR), v. 22, no. 4, Jul.-Aug. 1984 p 637-639 (For primary document see N85-25284 15-12)
Avail: NTIS HC A08/MF A01

99 GENERAL

N85-26589# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AGARD BULLETIN: MEETINGS, PUBLICATIONS, MEMBERSHIP
Loughton, England Jan. 1985 75 p
(AGARD-Bul-85/1) Avail: NTIS HC A04/MF A01

Included are abstracts of papers, lists of papers and a calendar of events for activities of those NATO member nations engaged in aerospace technology transfers. The period covered for technical papers is the 1984 calendar year. The calendar of events and activities, mostly meetings and conferences pertaining to specific technical aerospace fields, is for the 1985 calendar year. G.L.C.

N85-26590*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NASA AMES SUMMER HIGH SCHOOL APPRENTICESHIP RESEARCH PROGRAM
Patricia Powell Apr. 1985 108 p refs Program held at Moffett Field, Calif., 16 Jun. - 17 Aug. 1984
(NASA-TM-86006; A-9852; NAS 1.15:86006) Avail: NTIS HC A06/MF A01 CSCL 05I

The Summer High School Apprenticeship Research Program (SHARP) is described. This program is designed to provide engineering experience for gifted female and minority high school students. The students from this work study program which features trips, lectures, written reports, and job experience describe their individual work with their mentors. For individual titles, see N85-26591 through N85-26609.

N85-26591*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LACK OF COMMUNICATION c32
James Aguilar *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 5-6 (For primary document

see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 17B

Attempts at establishing dependable lines of communication with isolated third world nations are outlined. INTELSAT as well as the Application Technology Satellites systems are mentioned. A prototype system called Thin Route is proposed. E.R.

N85-26592*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PRIMATE EXPERIMENTS ON SLS-1 **c16**
Julie Aochi *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 9-14 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 22A

Experiments to study how certain body systems are affected by the space environment are described. These experiments are to be conducted on space shuttle flights. How weightlessness affects two body systems of primates are the prime concern. Thermoregulation and fluid and electrolyte homeostasis are the two systems concerned. The thermoregulation project will provide data on how body temperature and circadian rhythms are affected in a weightlessness environment and the homeostasis in fluids and electrolyte levels will address the problem of body fluid shifts. E.R.

N85-26593*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IS THERE MORE THAN ONE STEADY STATE FOR NOx? **c45**
George Bakas *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 15-18 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 13B

The study of alternative steady states for nitrogen oxides is discussed: The production of these oxides and the reactions they undergo in the atmosphere are described. The computerized modelling of the atmosphere using a one dimensional time dependent photochemical model is attempted. E.R.

N85-26594*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE PHYSICAL EFFECTS OF DIFFERENT STRESS SITUATIONS ON GRAPHITE/EPOXY COMPOUNDS **c24**
Derrick Brazill *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 21-28 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 11D

The physical effects of different stress situations on graphite/epoxy compounds were investigated. Weight loss was observed during a thermal spike for T300/5209 laminates. The diffusion and swelling in graphite/epoxy composites were investigated. The hygrothermal effects of a graphite/epoxy compound near the glass transition temperature (T sub g) were also studied. B.W.

N85-26595*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HARRIER **c05**
Sean Caffee *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 31-34 (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 01C

The Harrier Aircraft which has the ability to take off vertically and hover like a helicopter is discussed. This aircraft can also fly at high speeds like a conventional jet. It is this feature that separates the Harrier into a new class of airplanes. Two major characteristics of the Harrier aircraft are examined: (1) the hover ability; (2) the reaction control system which enables the Harrier to maneuver while in the hover mode. B.W.

N85-26596*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
VOYAGE TO URANUS **c12**
Mindy Dalrymple *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 35-38 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 22A

Preparations being made for the Voyager 2's encounter with the seventh planet, Uranus are discussed. Research activities involved with the methane in Uranus' atmosphere and its absorption of photons of sunlight are discussed. B.W.

N85-26597*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A BRIEF DESCRIPTION OF THE TWO PRIMATE EXPERIMENTS TO BE CARRIED OUT ON SL-4 **c16**
Louise Elsea *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 41-44 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 22A

Two primate experiments to be carried on Spacelab 4 are discussed. One of these investigates thermoregulation of primates during altered gravity. In previous ground-based tests, primate heat distribution was shown to change during centrifugation (a way of subjecting subjects to higher-than-Earth gravity), the inner body cooling off and the skin temperature rising. The adaptive and homeostatic mechanisms triggered by spaceflight are studied. Ways in which to correct any undesirable shifts in the homeostatic capabilities of the thermoregulatory control system are addressed. The other experiment involving primates addressess the changes in fluid distribution and electrolyte content of blood that occur in spaceflight. During previous space missions, fluid shifts from the legs to the chest and head have been noted. Ground-based studies have shown decreases in blood potassium levels and increases in potassium excretion. B.W.

N85-26598*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THIN ROUTE PROJECT **c32**
S. Gregory Felix *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 47-51 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 17B

An overview of NASA efforts to improve on the number of carriers for satellite communication systems is presented. A brief history of satellite telecommunication systems and their use in linking underdeveloped areas, along with a brief explanation of the necessary hardware is also given. G.L.C.

N85-26599*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WHAT IS BEING DONE TO CONTROL MOTION SICKNESS? **c52**
Yvette D. Hall *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 53-56 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 06E

AFT (Autogenic Feedback Training) involves practicing a series of mental exercises to speed up or slow down the control of autonomic activity. This produces a reduced tendency for autonomic activity levels to diverge from baseline (at rest) under stressful motion-sickness-inducing conditions. Subjects conditions. Subjects engaged in applying AFT exercises are required to closely monitor their own bodily sensations during motion-sickness-eliciting tests. These tests include the Coriolis Sickness Susceptibility Index (CSSI), which consists of sitting a subject into a rotating chair that moves at various speeds while a visual background turns at differing speeds and directions, and the Vertical Acceleration Rotation Device (VARD) test, which involves the placing of a subject in a drum that moves in an upward and downward motion until he or she is sick, while simultaneously monitoring the subject's vital signs. These tests provide investigators with evidence of slight changes in autonomic activities such as increases in heart rate, skin temperature, and sweat. All of these symptoms occur in subjects that experience bodily weakness or discomfort with the onset of motion sickness. G.L.C.

N85-26600*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMMUNICATIONS **c32**
Sadie Hathorn *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 59-61 (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 17B

An overview of NASA's Thin Route satellite telecommunication project is presented. Thin Route employs applications technology satellites (ATS) in place of more costly commercial multi- transponder telecommunications satellites. This system allows remote and underdeveloped areas to communicate with the outside world for purposes of obtaining medical assistance among other things. The system represents a substantial cost saving over commercial systems. G.L.C.

N85-26601*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GALILEO **c18**
Cynthia Hwang *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 63-66 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 22B

The Galileo consists of two main parts: a Jupiter orbiter and a probe. After a 1000 day journey, the Galileo will assume orbit around the giant planet, an orbit which will last for 200 days, in the hopes of astronomers. The orbit will carry the Galileo past its four Jovian satellites--Io, Europa, Ganymede, and Callisto - a combined total of 11 times. This will enable scientists to study the atmosphere of not only the largest planet in the solar system, but its large moons as well. Sometime in August of 1988, the Galileo will approach Jupiter and begin its important activities. Fifty-six days away from planetary encounter, the Galileo will release the probe which will continue the trip to Jupiter and enter the atmosphere. As it descends through the atmosphere, the probe will unfurl a parachute to slow its speed as it broadcasts information back to the waiting orbiter, which will in turn relay it back to the waiting scientists on Earth. The probe's descent time is expected to be approximately 15 min before Jupiter's pressure and heat overwhelm the probe's protection. However, scientists are hopeful that the probe will survive longer than 15 min, possibly up to 60 min. G.L.C.

N85-26602*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AIRCRAFT SAFETY IMPROVEMENT **c03**
Gloria Kao *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 69-74 (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 01C

Fabrication and testing of honeycomb sandwich aircraft panels are discussed. Also described is the use of the following instruments: thermogravimetric analyzer, differential scanning calorimeter, limiting oxygen index, and infrared spectrometer. B.G.

N85-26603*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM **c54**
Kenneth Ko *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 77-78 ref (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 06K

A Controlled Ecological Life Support System (CELSS) is needed which would convert waste water to usable water, waste products to food, and CO2 to O2 to permit long duration space flight. Algae, representing the autotroph, and mice, representing the heterotroph are placed together in a controlled, gas closed environment to examine the gas exchange rate of O2 and CO2. The eventual goal is to develop biological controls that can stabilize atmospheres. B.G.

N85-26604*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS (CELSS) **c54**
Mousumi Majumdar *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 81-87 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 06K

One of the major problems facing researchers in the design of a life support system is to construct it so that it will be capable of regulating waste materials and gases, while at the same time supporting the inhabitants with adequate food and oxygen. The basis of any gaseous life supporting cycle is autotrophs (plants that photosynthesize). The major problem is to get the respiratory quotient (RQ) of the animals to be equivalent to the assimilatory quotient (AQ) of the plants. A technique is being developed to control the gas exchange. The goal is to determine the feasibility of manipulating the plant's AQ by altering the plants environment in order to eliminate the mismatch between the plant's AQ and the animal's RQ. B.G.

N85-26605*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
YAV-8B HARRIER **c05**
Daniel Ornelas *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 89-91 ref (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 01C

The objective of the YAV-8B flight research program is to develop and validate the technologies required for V/STOL aircraft to effectively operate in all mission phases. Specifically, inflight dynamics, controls and guidance, and propulsive lift technologies that will contribute to an improved adverse weather launch and recovery operation capability will be developed and evaluated. The cockpit panel is measured and reproduced for integration into a flight simulator. B.G.

N85-26606*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PROGRAMMING FOR PIONEER 12 **c15**
Bruce C. Shem *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 93-97 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 22B

Background on Pioneer probes 6 to 11 is given as well as an overview of the Pioneer Venus mission. A computer program was written in C language for analyzing radio signals from the Pioneer Venus orbiter. A second program was written to facilitate high gain antenna commands to move the antenna itself, to set the simulated spin period, and to set the attitude control system angle. A.R.H.

N85-26607*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CARDIOVASCULAR EFFECTS OF WEIGHTLESSNESS **c52**
Kendra Short *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 99-103 ref (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 06P

Physiological changes resulting from long term weightlessness are reviewed and activities conducted to study cardiovascular deconditioning at NASA Ames are discussed. Emphasis is on using monkeys in chair rest, water immersion, and tilt table studies to simulate space environment effects. A.R.H.

N85-26608*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ROTORCRAFT DIGITAL ADVANCED AVIONICS SYSTEM (RODAAS) **c05**
Brent Taira *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 105-108 (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 01C

A simulator is being built to determine the practicality of using an advanced avionics system in a helicopter. Features include an autopilot; a navigation and flight planning component; an advisory system built into the computer; conventional gages and displays; a clock function; a fuel totalizer; a weight and balance computator; a performance evaluator; and emergency and normal checklists. The translation of a computer program written in PASCAL into a form that can be read by the graphics package for the simulator and basic electronic work in simulator construction are discussed.
A.R.H.

N85-26609*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE c55
Ann Tucher *In its* NASA Ames Summer High School Apprenticeship Res. Program Apr. 1985 p 109-110 refs (For primary document see N85-26590 15-99)
Avail: NTIS HC A06/MF A01 CSCL 03C

The development of NASA's SETI project and strategies for searching radio signals are reviewed. A computer program was written in FORTRAN to set up data from observations taken at Jodrell Bank. These data are to be used with a larger program to find the average radio signal strength at each of the approximately 63,000 channels.
A.R.H.

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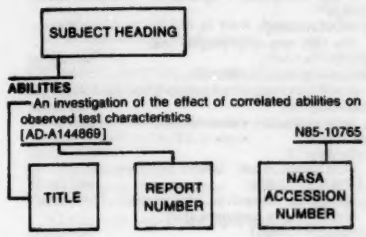

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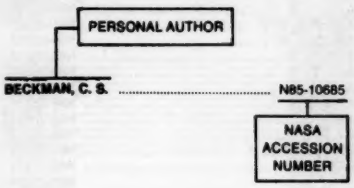

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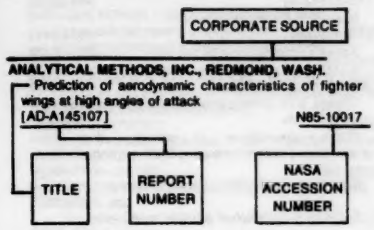

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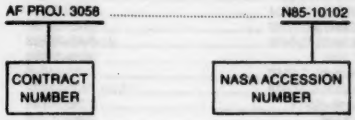

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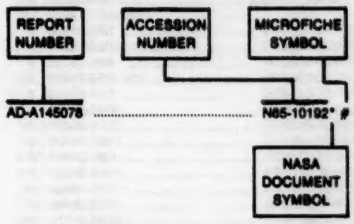

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BLL-CE-TRANS-8080-(9022.09) N85-25791

BLL-M-36141-(5828.4) N85-25752

BLL-RARDE-TR-1177-(7291.7965) N85-25470

BLL-RISLEY-TR-5097-(9091.9F) N85-25471
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